IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Reissue Application of:	Bill L. Davis and Jesse S. Williamson
Entitled:	COMBINED LITHOGRAPHIC/FLEXOGRAPHIC PRINTING APPARATUS AND PROCESS
For:	Reissue of U.S. Patent 5,630,363
Filed:	May 20, 1999
Serial No.:	09/315,796
Examiner:	Not Yet Assigned
Group Art Unit:	2854

SUPPLEMENTAL STATEMENT OF PRIOR ART AND OTHER INFORMATION

APPENDIX 2

II. Documents Pertinent to Series Commencing with United States Serial No. 08/538,274 filed October 2, 1995 issued as U.S. Patent No. 5,598,777 on February 4, 1997

Index No.	Description
13	U.S. Patent No. 5,598,777 entitled: Retractable Printing/Coating Unit Operable on the Plate and Blanket Cylinders, Issued on February 4, 1997 to Howard W. DeMoore, Ronald M. Rendleman and John W. Bird, Assignee: Howard W. DeMoore
14	U.S. Patent No. 4,308,796 entitled: Offset Lithographic Press with Ink Metering System for Blanket Cylinder, Issued on January 5, 1982, Assignee: S-W-H, Ltd.
15	U.S. Patent No. 4,706,601 entitled: Device for Applying Medium After Termination of the Printing Operation in a Printing Machine, Issued on November 17, 1987, Assignee: Heidelberger Druckmaschinen AG
16	European Patent Application No. EP 0 767 057 A3 entitled: A Rotary Offset Printing Press, Applicant: Howard W. DeMoore, Inventors: Howard W. DeMoore and Ronald M. Rendleman, Filed October 2, 1996, Date of Publication A3: June 10, 1998, Date of Publication A2: April 9, 1997

Index No.	Description
17	U.S. Patent No. 4,615,293 entitled: Medium-Applying Device in a Printing Machine Issued on October 7, 1986 to Hans-Georg Jahn, Assignee: Heidelberger Druckmaschinen AG
18	European Patent Application No. 0 293 586, Applicant: MAN Roland Druckmaschinen AG, Inventor: David J. Sarazen
19	U.K. Patent Application No. GB 2 263 438 A entitled: Printing Apparatus, Filed: January 21, 1993, Applicant: The Langston Corporation, Inventor: Joseph John Weishew U.S. Patent No. 5,243,907 entitled: Divider Seal for Split-Fountain Chambered Doctor Blade for a Flexographic Printing Press, Issued September 14, 1993 to Joseph J. Weishew, Assignee: The Langston Corporation
20	CH 319 962 to Maschinenfabrik Winkler, Fallert & Co.
21	Japanese Application No. 96281428

09315796.051001

13

US005598777A

United States Patent [19]

DeMoore et al.

[11] Patent Number: 5,598,777

[45] Date of Patent: Feb. 4, 1997

[54] **RETRACTABLE PRINTING/COATING UNIT OPERABLE ON THE PLATE AND BLANKET CYLINDERS**

[75] Inventors: **Howard W. DeMoore**, 10954 Shady Trail, Dallas, Tex. 75220; **Ronald M. Rendleman**, Dallas; **John W. Bird**, Carrollton, both of Tex.

[73] Assignee: **Howard W. DeMoore**, Dallas, Tex.

[21] Appl. No.: **538,274**

[22] Filed: **Oct. 2, 1995**

[51] **Int. Cl.**[6] **B41F 5/02**; B41F 5/22; B41F 31/36

[52] **U.S. Cl.** **101/177**; 101/352

[58] **Field of Search** 101/349, 350, 101/351, 352, 207, 208–210, 363, 364, 147, 148, 143, 144, 217, 218, 177, 247; 118/258–262, 46, 263

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,308,796	1/1982	Satterwhite	101/350
4,706,601	11/1987	Jahn	118/211

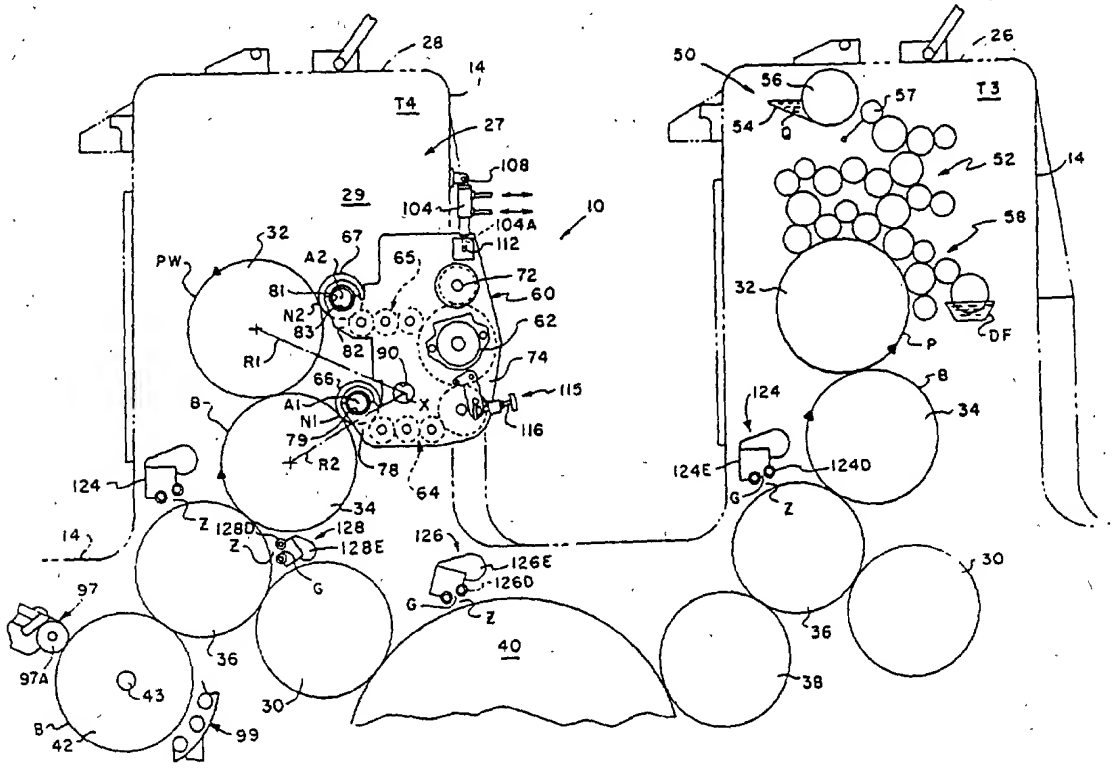
Primary Examiner—J. Reed Fisher

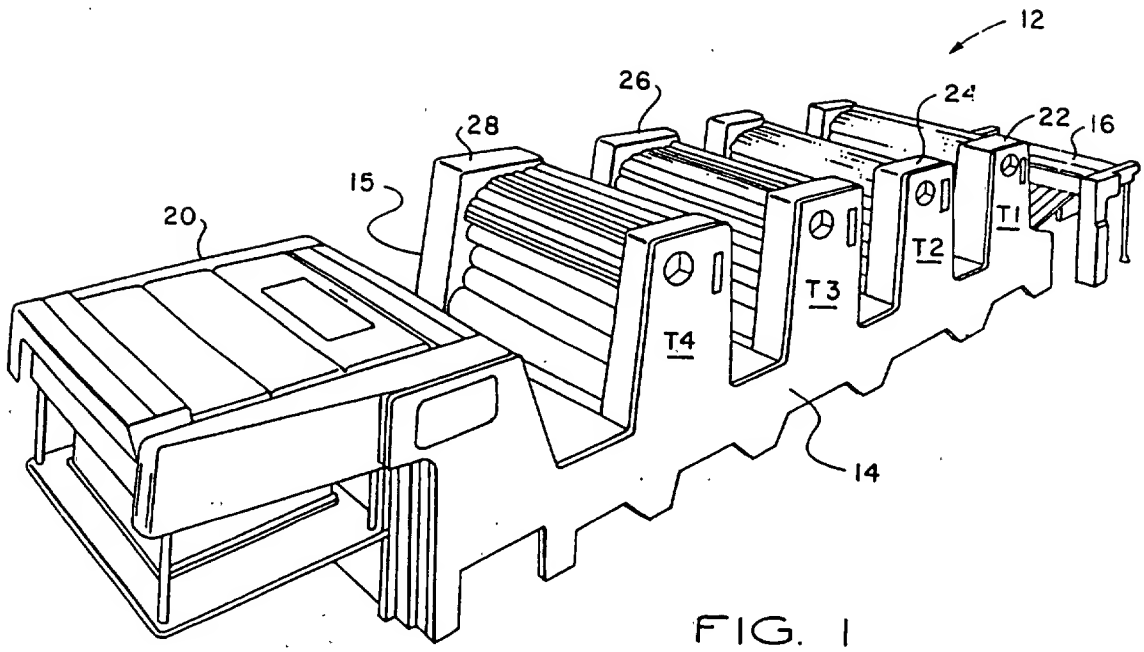
Attorney, Agent, or Firm—Sidley & Austin

[57] **ABSTRACT**

A retractable in-line inking/coating apparatus can apply either spot or overall inking/coating material to a plate and/or a blanket on the first printing unit or on any consecutive printing unit of any rotary offset printing press. The inking/coating apparatus is pivotally mounted within the conventional dampener space of any lithographic printing unit. The aqueous component of the flexographic printing ink or aqueous coating material is evaporated and dried by high velocity, hot air dryers and high performance heat and moisture extractors so that the aqueous or flexographic ink or coating material on a freshly printed or coated sheet is dry and can be dry-trapped on the next printing unit. The inking/coating apparatus includes dual cradles that support first and second applicator rollers so that the inking/coating apparatus can apply a double bump of aqueous/flexographic or UV-curable printing ink or coating material to a plate on the plate cylinder, while simultaneously applying aqueous, flexographic or UV-curable printing ink or coating material to a plate or a blanket on the blanket cylinder, and thereafter onto a sheet as the sheet is transferred through the nip between the blanket cylinder and the impression cylinder. A triple bump is printed or coated on the last printing unit with the aid of an impression cylinder inking/coating unit.

19 Claims, 10 Drawing Sheets

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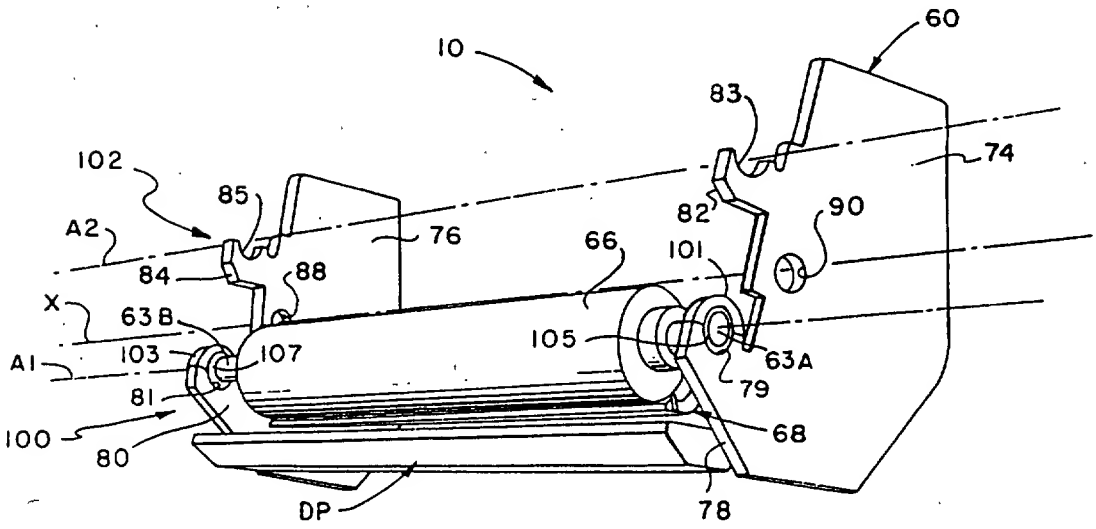
22
16
15
20
T1
T2
T3
T4
14

FIG. 1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102
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82
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A2
76
66
101
84
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X
63B
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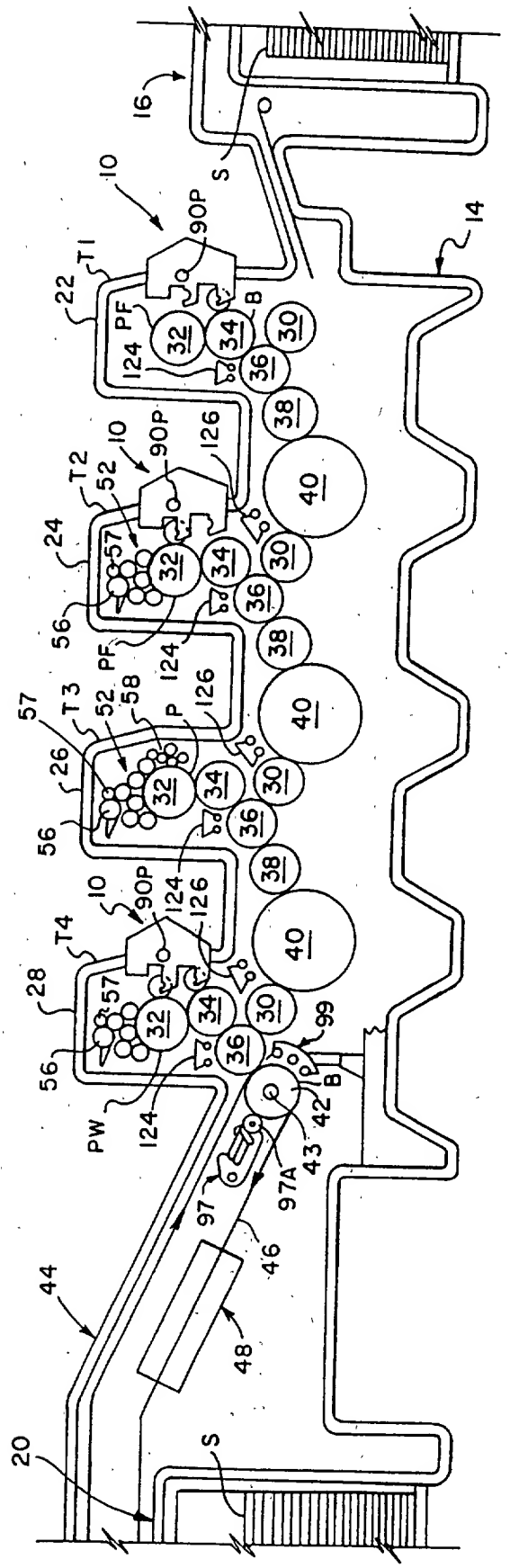
63A
A1
103
107
79
81
68
100
80
DP
78

FIG. 2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10
90P
S
14
T1
22
PF
124
B
32
34
30
36
38
40
T2
52
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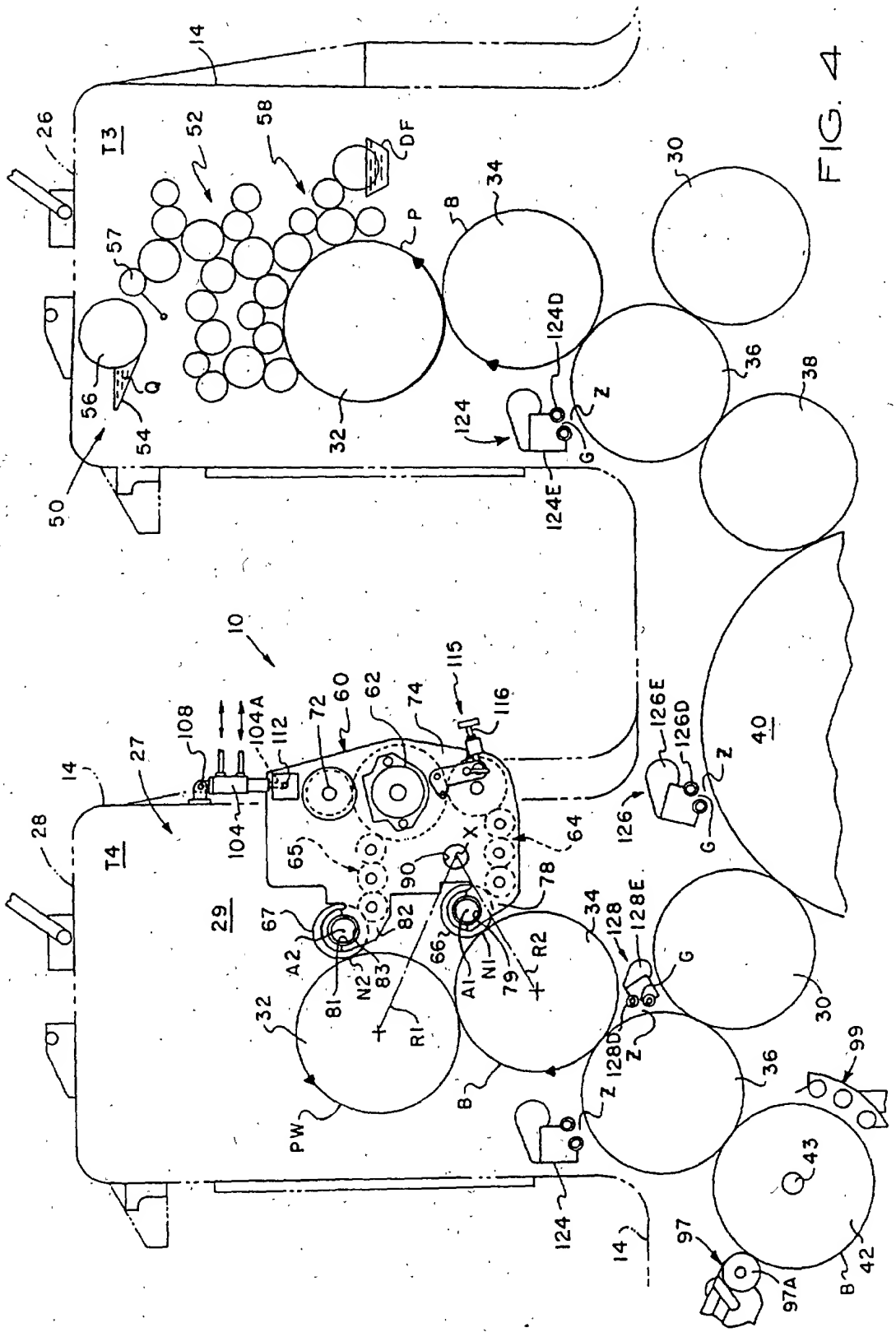
57
56
126
T3
58
P
26
T4
28
99
PW
42
43
97A
97
46
48
44
20

FIG. 3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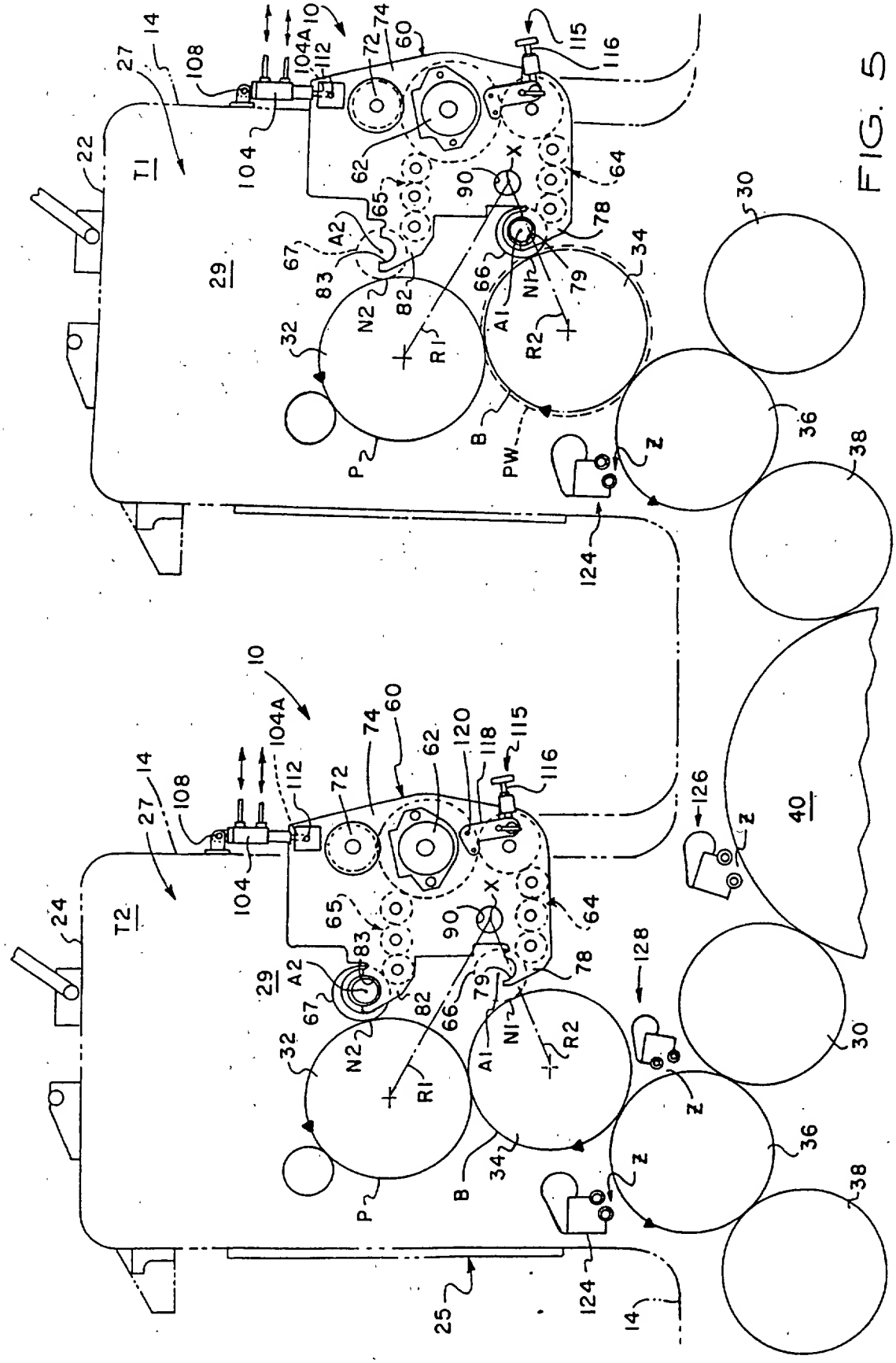
26
T3
52
58
DF
57
P
8
34
30
56
Q
54
50
32
124
124D
Z
G
36
38
124E
10
108
104A
112
72
60
62
74
115
116
27
14
104
T4
28
65
90
X
64
126
126E
126D
40
29
67
82
78
34
128
128E
A2
N2
83
66
A1
N1
79
R2
81
R1
32
G
30
128D
Z
36
99
B
PW
43
124
14
97
97A
42

FIG. 4


T1
T2
29
10
104A
104
108
112
14
27
22
24
72
74
60
62
64
65
67
83
82
66
78
79
90
115
116
118
120
126
128
124
125
30
34
36
38
40
A1
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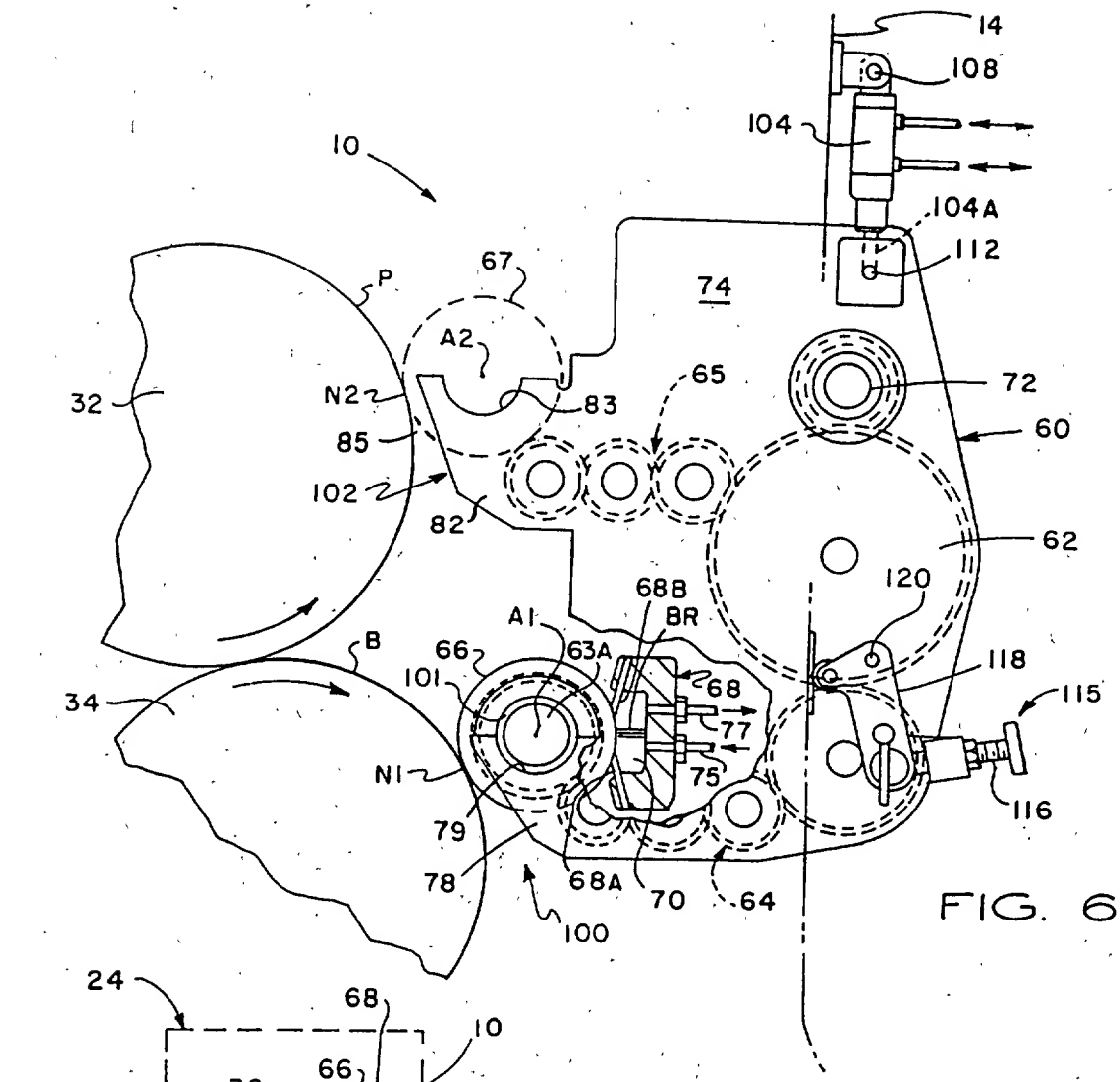
N2
R1
R2
P
B
PW
Z
X

FIG. 5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108
104
104A
112
10
67
P
74
A2
72
32
N2
83
65
60
85
102
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62
120
68B
BR
A1
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75
116
79
78
68A
70
64
100

FIG. 6

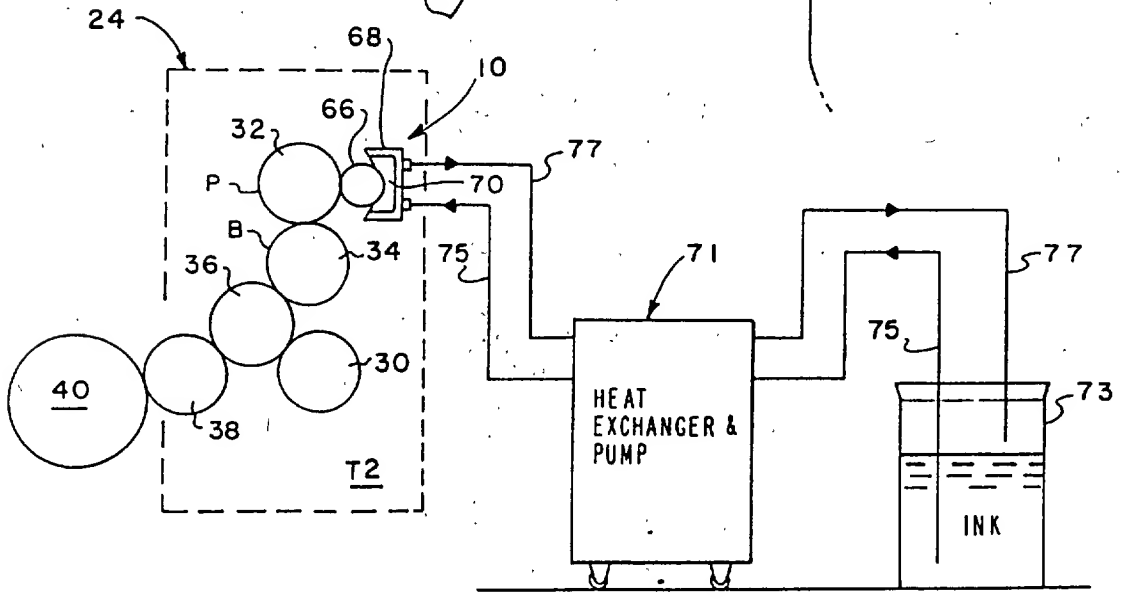
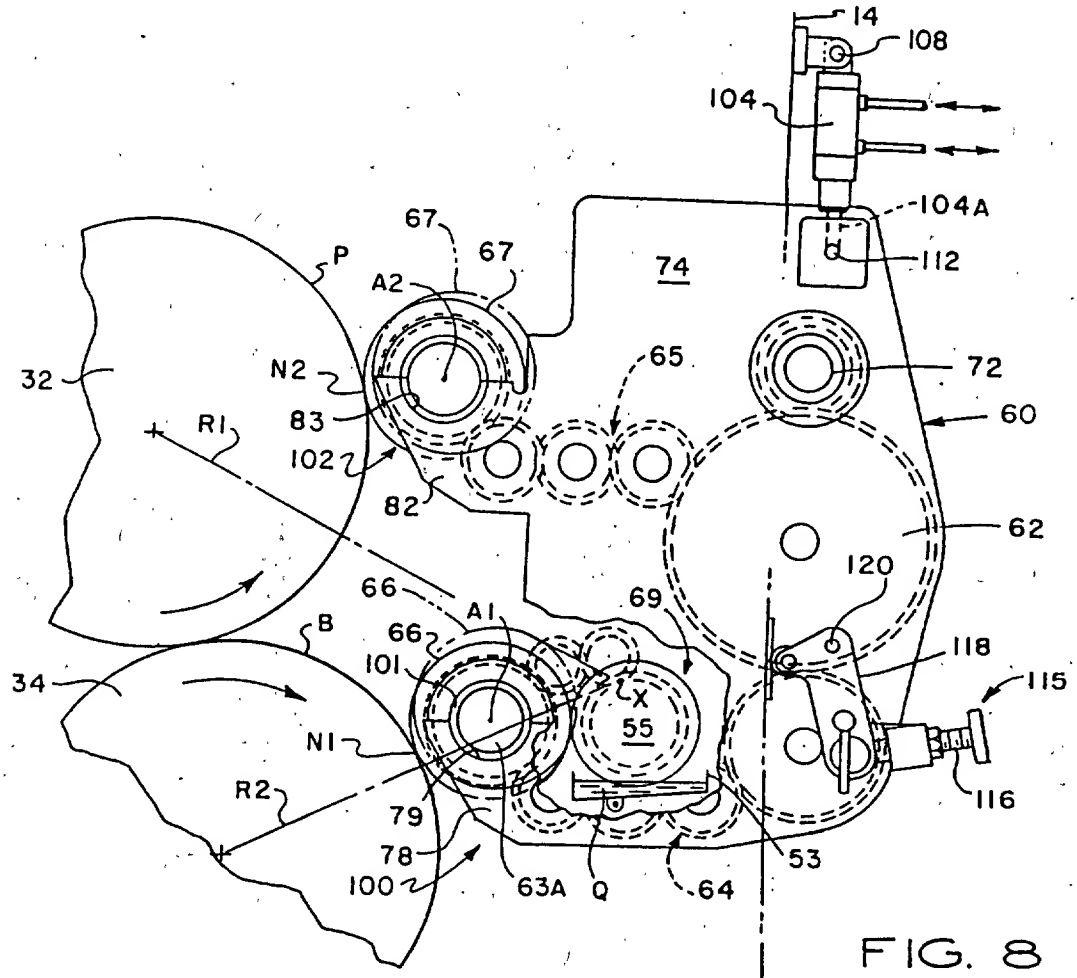

24
68
10
66
32
77
P
70
B
34
75
71
77
36
75
30
40
HEAT
EXCHANGER &
PUMP
73
38
INK
T2

FIG. 7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108
104
104A
112
67
67
P
A2
74
32
N2
65
72
60
R1
83
102
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62
120
66
A1
69
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X
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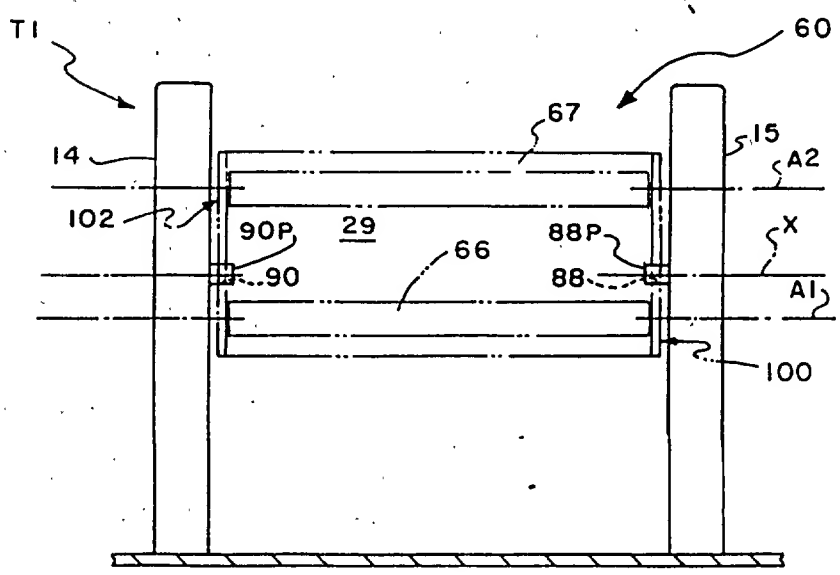
R2
79
116
78
53
100
63A
Q
64

FIG. 8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67
14
15
A2
102
90P
29
88P
X
66
90
88
A1
100

FIG. 9

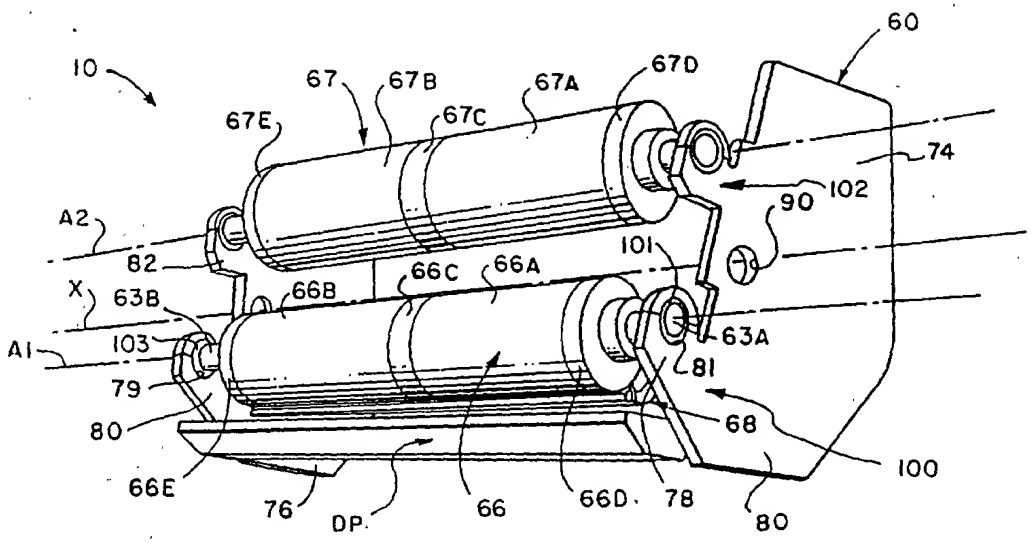


FIG. 10

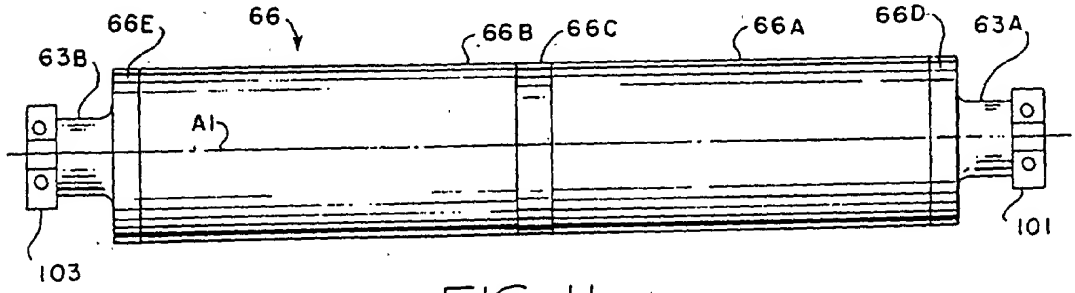
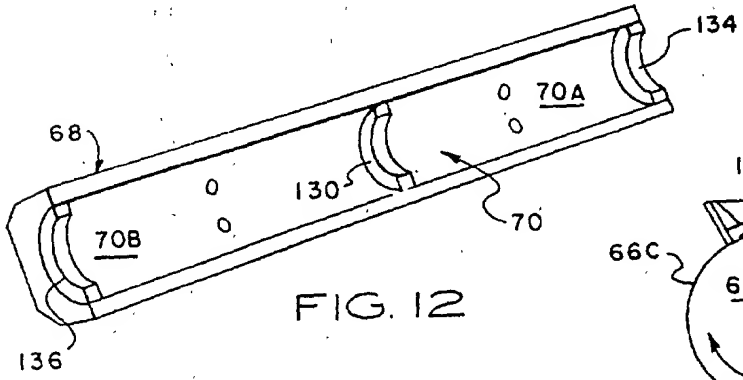


FIG. 11



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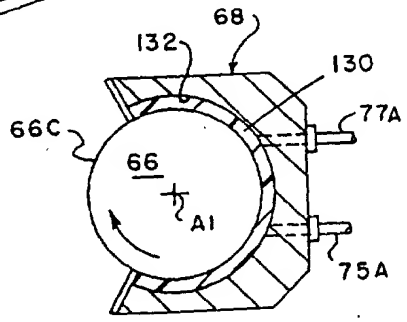
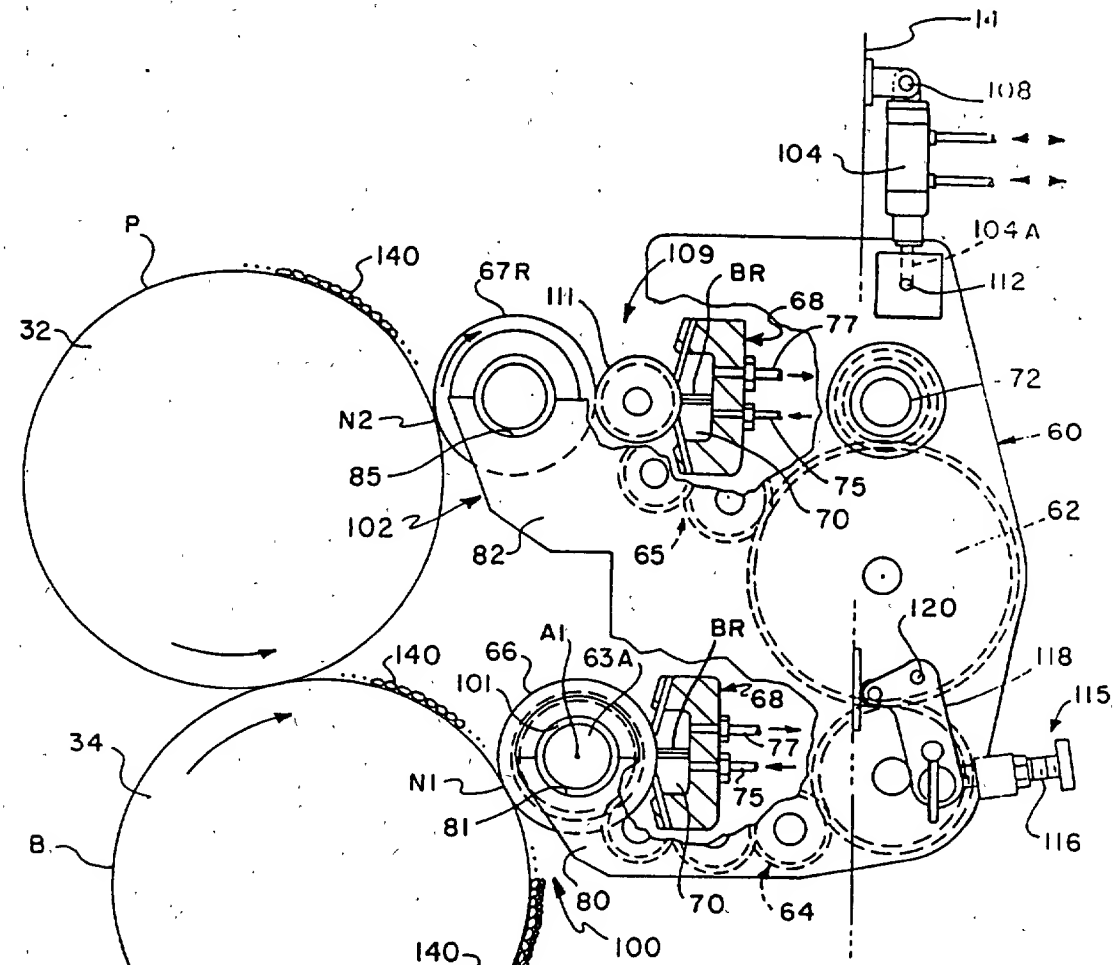


FIG. 13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104A
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111
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72
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62
P
140
32
N2
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65
75
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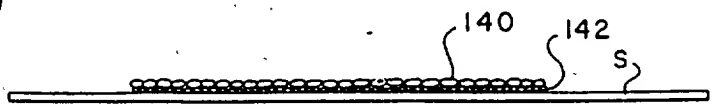
142
36
30

FIG. 14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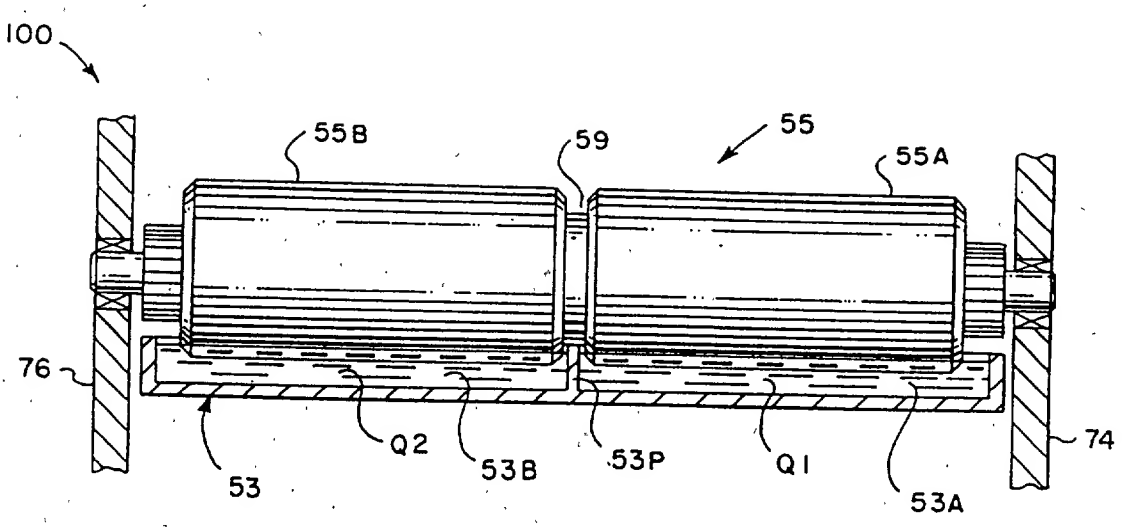
142
S

FIG. 15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55B
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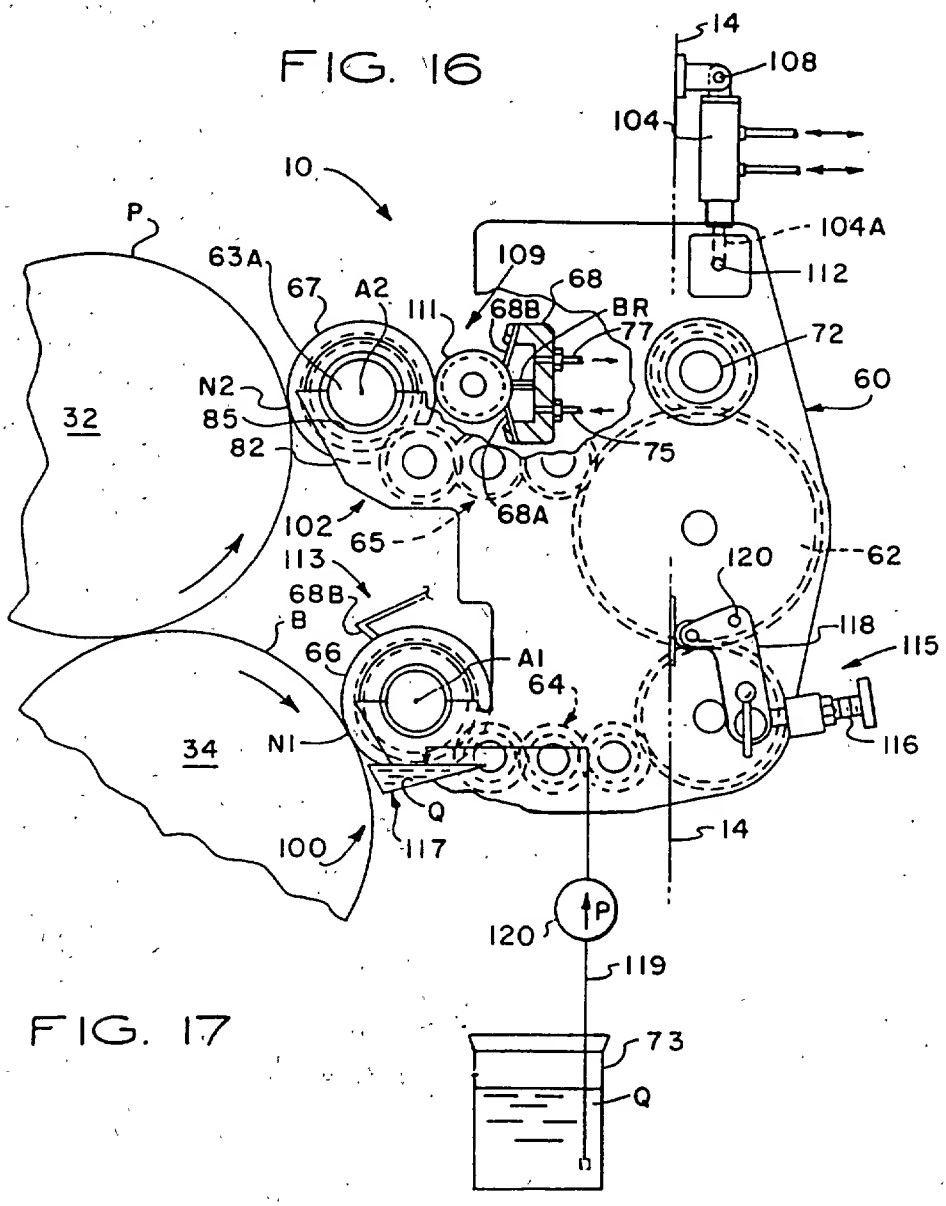
55A
76
74
Q2
53B
53P
Q1
53
53A

FIG. 16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85
32
82
75
68A
102
65
120
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113
68B
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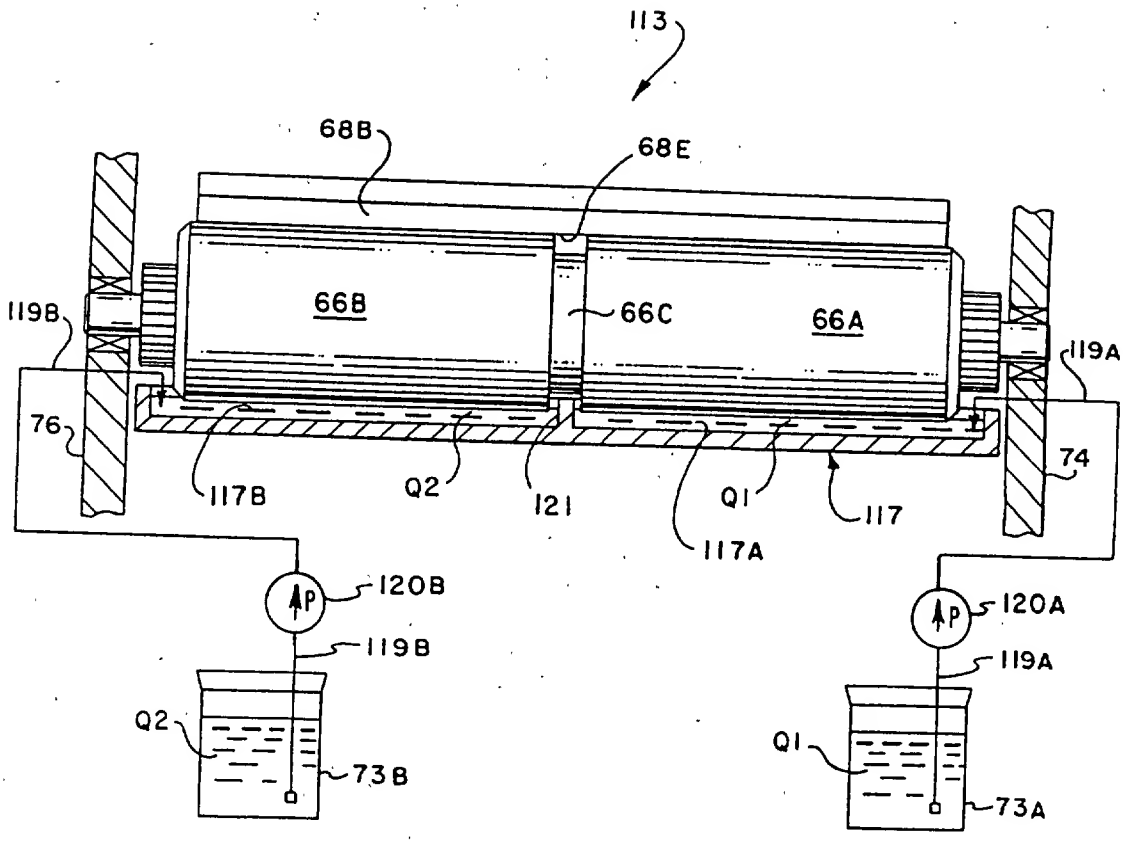
Q

FIG. 17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117A
120B
120A
119B
119A
Q2
Q1
73B
73A

FIG. 18

RETRACTABLE PRINTING/COATING UNIT OPERABLE ON THE PLATE AND BLANKET CYLINDERS

FIELD OF THE INVENTION

This invention relates generally to sheet-fed or web-fed, rotary offset lithographic printing presses, and more particularly, to a new and improved inking/coating apparatus for the in-line application of aqueous or flexographic printing inks, primer or protective/decorative coatings applied simultaneously to the plate and blanket of the first or any consecutive printing unit of any lithographic printing press.

BACKGROUND OF THE INVENTION

Conventional sheet-fed, rotary offset printing presses typically include one or more printing units through which individual sheets are fed and printed. After the last printing unit, freshly printed sheets are transferred by a delivery conveyor to the delivery end of the press where the freshly printed and/or coated sheets are collected and stacked uniformly. In a typical sheet-fed, rotary offset printing press such as the Heidelberg Speedmaster line of presses, the delivery conveyor includes a pair of endless chains carrying gripper bars with gripper fingers which grip and pull freshly printed sheets from the last impression cylinder and convey the sheets to the sheet delivery stacker.

Since the inks used with sheet fed rotary offset printing presses are typically wet and tacky, special precautions must be taken to prevent marking and smearing of the freshly printed or coated sheets as the sheets are transferred from one printing unit to another. The printed ink on the surface of the sheet dries relatively slowly and is easily smeared during subsequent transfer between printing units. Marking, smearing and smudging can be prevented by a vacuum assisted sheet transfer apparatus as described in the following U.S. Pat. Nos.: 5,113,255; 5,127,329; 5,205,217; 5,228,391; 5,243,909; and 5,419,254, all to Howard W. DeMoore, co-inventor, and manufactured and sold by Printing Research, Inc. of Dallas, Tex., U.S.A. under its trademark BACVAC™.

In some printing jobs, offsetting is prevented by applying a protective and/or decorative coating material over all or a portion of the freshly printed sheets. Some coatings are formed of a UV-curable or water-dispersed resin applied as a liquid solution over the freshly printed sheets to protect the ink from offsetting or set-off and improve the appearance of the freshly printed sheets. Such coatings are particularly desirable when decorative or protective finishes are applied in the printing of posters, record jackets, brochures, magazines, folding cartons and the like.

DESCRIPTION OF THE PRIOR ART

Various arrangements have been made for applying the coating as an in-line printing operation by using the last printing unit of the press as the coating application unit. For example, U.S. Pat. Nos. 4,270,483; 4,685,414; and 4,779,557 disclose coating apparatus which can be moved into position to permit the blanket cylinder of the last printing unit of a printing press to be used to apply a coating material over the freshly printed sheets. In U.S. Pat. No. 4,841,903 (Bird) there are disclosed coating apparatus which can be selectively moved between the plate cylinder or the blanket cylinder of the last printing unit of the press so the last printing unit can only be used for coating purposes. However, when coating apparatus of these types are being used, the last printing unit cannot be used to print ink to the sheets, but rather can only be used for the coating operation. Thus, while coating with this type of in-line coating apparatus, the printing press loses the capability of printing on the last printing unit as it is converted to a coating unit.

The coater of U.S. Pat. No. 5,107,790 (Sliker et al) is retractable along an inclined rail for extending and retracting a coater head into engagement with a blanket on the blanket cylinder. Because of its size, the rail-retractable coater can only be installed between the last printing unit of the press and the delivery sheet stacker, and cannot be used for interunit coating. The coater of U.S. Pat. No. 4,615,293 (Jahn) provides two separate, independent coaters located on the dampener side of a converted printing unit for applying lacquer to a plate and to a rubber blanket. Consequently, although a plate and blanket are provided, the coating unit of Jahn's press is restricted to a dedicated coating operation only.

Proposals have been made for overcoming the loss of a printing unit when in-line coating is used, for example as set forth in U.S. Pat. No. 5,176,077 to Howard W. DeMoore (co-inventor and assignee), which discloses a coating apparatus having an applicator roller positioned to apply the coating material to the freshly printed sheet while the sheet is still on the last impression cylinder of the press. This allows the last printing unit to print and coat simultaneously, so that no loss of printing unit capability results.

Some conventional coaters are rail-mounted and occupy a large amount of press space and reduce access to the press. Elaborate equipment is needed for retracting such coaters from the operative coating position to the inoperative position, which reduces access to the printing unit.

Accordingly, there is a need for an in-line inking/coating apparatus which does not result in the loss of a printing unit, does not extend the length of the press, and which can print and coat aqueous and flexographic inks and coating materials simultaneously onto the plate and blanket on any lithographic printing unit of any lithographic printing press, including the first printing unit.

OBJECTS OF THE INVENTION

Accordingly, a general object of the present invention is to provide improved inking/coating apparatus which is capable of selectively applying ink or coating material to a plate on a plate cylinder or ink or coating material to a plate or blanket on a blanket cylinder.

A specific object of the present invention is to provide improved inking/coating apparatus of the character described which is extendable into inking/coating engagement with either a plate on a plate cylinder or to a plate or blanket on a blanket cylinder.

A related object of the present invention is to provide improved inking/coating apparatus of the character described which is capable of being mounted on any lithographic printing unit of the press and does not interfere with operator access to the plate cylinder, blanket cylinder, or adjacent printing units.

Another object of the present invention is to provide improved inking/coating apparatus of the character described, which can be moved from an operative inking/coating engagement position adjacent to a plate cylinder or a blanket cylinder to a non-operative, retracted position.

Still another object of the present invention is to provide improved inking/coating apparatus of the character described, which can be used for applying aqueous, flexo-

graphic and ultra-violet curable inks and/or coatings in combination with lithographic, flexographic and waterless printing processes on any rotary offset printing press.

A related object of the present invention is to provide improved inking/coating apparatus of the character described, which is capable of applying aqueous or flexographic ink or coating material on one printing unit, for example the first printing unit, and drying the ink or coating material before it is printed or coated on the next printing unit so that it can be overprinted or overcoated immediately on the next printing unit with waterless, aqueous, flexographic or lithographic inks or coating materials.

Yet another object of the present invention is to provide improved inking/coating apparatus for use on a multiple color rotary offset printing press that can apply ink or coating material separately and/or simultaneously to the plate and/or blanket of a printing unit of the press from a single operative position, and from a single inking/coating apparatus.

A related object of the present invention is to provide improved inking/coating apparatus of the character described, in which virtually no printing unit adjustment or alteration is required when the inking/coating apparatus is converted from plate to blanket printing or coating and vice versa.

Another object of the present invention is to provide improved inking/coating apparatus that can be operably mounted in the dampener space of any lithographic printing unit for inking/coating engagement with either a plate on a plate cylinder or a plate or blanket on a blanket cylinder, and which does not interfere with operator movement or activities in the interunit space between printing units.

SUMMARY OF THE INVENTION

The foregoing objects are achieved by a retractable, in-line inking/coating apparatus which is mounted on the dampener side of any printing unit of a rotary offset press for movement between an operative (on-impression) inking/coating position and a retracted, disengaged (Off-impression) position. The inking/coating apparatus includes an applicator roller which is movable into and out of engagement with a plate on a plate cylinder or a blanket on a blanket cylinder. The inking/coating applicator head is pivotally coupled to a printing unit by pivot pins which are mounted on the press side frames in the traditional dampener space of the printing unit in parallel alignment with the plate cylinder and the blanket cylinder. This dampener space mounting arrangement allows the inking/coating unit to be installed between any adjacent printing units on the press.

In the preferred embodiment, the applicator head includes vertically spaced pairs of cradle members with one cradle pair being adapted for supporting an inking/coating applicator roller in alignment with a plate cylinder, and the other cradle pair supporting an inking/coating applicator roller in alignment with the blanket cylinder, respectively, when the applicator head is in the operative position. Because of the pivotal support provided by the pivot pins, the applicator head can be extended and retracted within the limited space available in the traditional dampener space, without restricting operator access to the printing unit cylinders and without causing a printing unit to lose its printing capability.

When the inking/coating apparatus is used in combination with a flexographic printing plate and aqueous or flexographic ink or coating material, the water component of the aqueous or flexographic ink or coating material on the freshly printed or coated sheet is evaporated and dried by a high velocity, hot air interunit dryer and a high volume heat and moisture extractor assembly so that the freshly printed ink or coating material is dry before the sheet is printed or coated on the next printing unit. This quick drying process permits a base layer or film of ink, for example opaque white or metallic (gold, silver or other metallics) ink to be printed on the first printing unit, and then overprinted on the next printing unit without back-trapping or dot gain.

The construction and operation of the present invention will be understood from the following detailed description taken in conjunction with the accompanying drawings which disclose, by way of example, the principles and advantages of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a sheet fed, rotary offset printing press having inking/coating apparatus embodying the present invention;

FIG. 2 is a simplified perspective view of the single head, dual cradle inking/coating apparatus of the present invention;

FIG. 3 is a schematic side elevational view of the printing press of FIG. 1 having single head, dual cradle inking/coating apparatus installed in the traditional dampener position of the first, second and last printing units;

FIG. 4 is a simplified side elevational view showing the single head, dual cradle inking/coating apparatus in the operative inking/coating position for simultaneously printing on the printing plate and blanket on the fourth printing unit;

FIG. 5 is a simplified side elevational view showing the single head, dual cradle inking/coating apparatus in the operative position for spot or overall inking or coating on the blanket of the first printing unit, and showing the dual cradle inking/coating apparatus in the operative position for spot or overall inking or coating on the printing plate of the second printing unit;

FIG. 6 is a simplified side elevational view of the single head, dual cradle inking/coating apparatus of FIG. 4 and FIG. 5, partially broken away, showing the single head, dual cradle inking/coating apparatus in the operative coating position and having a sealed doctor blade reservoir assembly for spot or overall coating on the blanket;

FIG. 7 is a schematic view showing a heat exchanger and pump assembly connected to the single head, dual cradle inking/coating apparatus for circulating temperature controlled ink or coating material to the inking/coating apparatus;

FIG. 8 is a side elevational view, partially broken away, and similar to FIG. 6 which illustrates an alternative coating head arrangement;

FIG. 9 is a simplified elevational view of a printing unit which illustrates pivotal coupling of the inking/coating apparatus on the printing unit side frame members;

FIG. 10 is a view similar to FIG. 2 in which a pair of split applicator rollers are mounted in the upper cradle and lower cradle, respectively;

FIG. 11 is a side elevational view of a split applicator roller;

FIG. 12 is a perspective view of a doctor blade reservoir which is centrally partitioned by a seal element;

FIG. 13 is a sectional view showing sealing engagement of the split applicator roller against the partition seal element of FIG. 12;

FIG. 14 is a view similar to FIG. 8 which illustrates an alternative inking/coating embodiment;

FIG. 15 is a simplified side elevational view of a substrate which has a bronzed-like finish which is applied by simultaneous operation of the dual applicator roller embodiment of FIG. 14;

FIG. 16 is a side elevational view, partly in section, of a pan roller having separate transfer surfaces mounted on a split fountain pan;

FIG. 17 is a simplified side elevational view of the dual cradle inking/coating apparatus, partially broken away, which illustrates an alternative inking/coating head apparatus featuring a single doctor blade assembly, anilox applicator roller mounted on the lower cradle; and

FIG. 18 is a side elevational view, partly in section, of a single doctor blade anilox applicator roller assembly having separate transfer surfaces, and a split fountain pan having separate fountain compartments, with the separate fountain compartments being supplied with different inks or coating materials from separate off-press sources.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

As used herein, the term "processed" refers to printing and coating methods which can be applied to either side of a substrate, including the application of lithographic, waterless, UV-curable, aqueous and flexographic inks and/or coatings. The term "substrate" refers to sheet and web material. Also, as used herein, the term "waterless printing plate" refers to a printing plate having image areas and non-image areas which are oleophilic and oleophobic, respectively. "Waterless printing ink" refers to an oil-based ink which does not contain a significant aqueous component. "Flexographic plate" refers to a flexible printing plate having a relief surface which is wettable by flexographic ink or coating material. "Flexographic printing ink or coating material" refers to an ink or coating material having a base constituent of either water, solvent or UV-curable liquid. "UV-curable lithographic printing ink and coating material" refers to oil-based printing inks and coating materials that can be cured (dried) photomechanically by exposure to ultraviolet radiation, and that have a semi-paste or gel-like consistency. "Aqueous printing ink or coating material" refers to an ink or coating material that predominantly contains water as a solvent, diluent or vehicle. A "relief plate" refers to a printing plate having image areas which are raised relative to non-image areas which are recessed.

As shown in the exemplary drawings, the present invention is embodied in a new and improved in-line inking/coating apparatus, herein generally designated **10**, for applying aqueous, flexographic or UV-curable inks or protective and/or decorative coatings to sheets or webs printed in a sheet-fed or web-fed, rotary offset printing press, herein generally designated **12**. In this instance, as shown in FIG. **1**, the inking/coating apparatus **10** is installed in a four unit rotary offset printing press **12**, such as that manufactured by Heidelberger Druckmaschinen AG of Germany under its designation Heidelberg Speedmaster SM102 (40", 102 cm).

The press **12** includes a press frame **14** coupled at one end, herein the right end, to a sheet feeder **16** from which sheets, herein designated S, are individually and sequentially fed into the press, and at the opposite end, with a sheet delivery stacker **20** in which the freshly printed sheets are collected and stacked. Interposed between the sheet feeder **16** and the sheet delivery stacker **20** are four substantially identical sheet printing units **22**, **24**, **26** and **28** which can print four different colors onto the sheets as they are transferred through the press **12**. The printing units are housed within printing towers T1, T2, T3 and T4 formed by side frame members **14**, **15**. Each printing tower has a delivery side **25** and a dampener side **27**. A dampener space **29** is partially enclosed by the side frames on the dampener side of the printing unit.

As illustrated, the printing units **22**, **24**, **26** and **28** are substantially identical and of conventional design. The first printing unit **22** includes an in-feed transfer cylinder **30**, a plate cylinder **32**, a blanket cylinder **34** and an impression cylinder **36**, all supported for rotation in parallel alignment between the press side frames **14**, **15** which define printing unit towers T1, T2, T3 and T4. Each of the first three printing units **22**, **24** and **26** have a transfer cylinder **38** disposed to transfer the freshly printed sheets from the adjacent impression cylinder and transfer the freshly printed sheets to the next printing unit via an intermediate transfer drum **40**.

The last printing unit **28** includes a delivery cylinder **42** mounted on a delivery shaft **43**. The delivery cylinder **42** supports the freshly printed sheet **18** as it is transferred from the last impression cylinder **36** to a delivery conveyor system, generally designated **44**, which transfers the freshly printed sheet to the sheet delivery stacker **20**. To prevent smearing during transfer, a flexible covering is mounted on the delivery cylinder **42**, as described and claimed in U.S. Pat. No. 4,402,267 to Howard W. DeMoore, which is incorporated herein by reference. The flexible covering is manufactured and sold by Printing Research, Inc. of Dallas, Tex., U.S.A., under its trademark SUPER BLUE®. Optionally, a vacuum-assisted sheet transfer assembly manufactured and sold by Printing Research, Inc. of Dallas, Tex., U.S.A., under its trademark BACVAC® can be substituted for the delivery transfer cylinder **42** and flexible covering.

The delivery conveyor system **44** as shown in FIG. **3** is of conventional design and includes a pair of endless delivery gripper chains **46**, only one of which is shown carrying at regular spaced locations along the chains, laterally disposed gripper bars having gripper fingers used to grip the leading edge of a freshly printed or coated sheet **18** after it leaves the nip between the impression cylinder **36** and delivery cylinder **42** of the last printing unit **28**. As the leading edge is gripped by the gripper fingers, the delivery chains **46** pull the sheet away from the last impression cylinder **36** and convey the freshly printed or coated sheet to the sheet delivery stacker **20**.

Prior to reaching the delivery sheet stacker, the freshly printed and/or coated sheets S pass under a delivery dryer **48** which includes a combination of infra-red thermal radiation, high velocity hot air flow and a high performance heat and moisture extractor for drying the ink and/or the protective/decorative coating. Preferably, the delivery dryer **48**, including the high performance heat and moisture extractor is constructed as described in U.S. application Ser. No. 08/116,711, filed Sep. 3, 1993, entitled "Infra-Red Forced Air Dryer and Extractor" by Howard C. Secor, Ronald M. Rendleman and Paul D. Copenhaver, commonly assigned to the assignee of the present invention, Howard W. DeMoore, and licensed to Printing Research, Inc. of Dallas, Tex., U.S.A., which manufactures and markets the delivery dryer **48** under its trademark AIR BLANKET™.

In the exemplary embodiment shown in FIG. **3**, the first printing unit **22** has a flexographic printing plate PF mounted on the plate cylinder, and therefore neither an inking roller train nor a dampening system is required. A

flexographic printing plate PF is also mounted on the plate cylinder of the second printing unit **24**. The form rollers of the inking roller train **52** shown mounted on the second printing unit **24** are retracted and locked off to prevent plate contact. Flexographic ink is supplied to the flexographic plate PF of the second printing unit **24** by the inking/coating apparatus **10**.

A suitable flexographic printing plate PF is offered by E. I. du Pont de Nemours of Wilmington, Del., U.S.A., under its trademark CYREL®. Another source is BASF Aktiengesellschaft of Ludwigshafen, Germany, which offers a suitable flexographic printing plate under its trademark NYLOFLEX®.

The third printing unit **26** as illustrated in FIG. **3** and FIG. **4** is equipped for lithographic printing and includes an inking apparatus **50** having an inking roller train **52** arranged to transfer ink Q from an ink fountain **54** to a lithographic plate P mounted on the plate cylinder **32**. This is accomplished by a fountain roller **56** and a ductor roller **57**. The fountain roller **56** projects into the ink fountain **54**, whereupon its surface picks up ink. The lithographic printing ink Q is transferred from the fountain roller **56** to the inking roller train **52** by the ductor roller **57**. The inking roller train **52** supplies ink Q to the image areas of the lithographic printing plate P.

The lithographic printing ink Q is transferred from the lithographic printing plate P to an ink receptive blanket B which is mounted on the blanket cylinder **34**. The inked image carried on the blanket B is transferred to a substrate S as the substrate is transferred through the nip between the blanket cylinder **34** and the impression cylinder **36**.

The inking roller arrangement **52** illustrated in FIG. **3** and FIG. **4** is exemplary for use in combination with lithographic ink printing plates P. It is understood that a dampening system **58** having a dampening fluid reservoir DF is coupled to the inking roller train **52** (FIG. 4), but is not required for waterless or flexographic printing.

The plate cylinder **32** of printing unit **28** is equipped with a waterless printing plate PW. Waterless printing plates are also referred to as dry planographic printing plates and are disclosed in the following U.S. Pat. Nos.: 3,910,187; Reissue 30,670; U.S. Pat. No. 4,086,093; and U.S. Pat. No. 4,853,313. Suitable waterless printing plates can be obtained from Toray Industries, Inc. of Tokyo, Japan. A dampening system is not used for waterless printing, and waterless (oil-based) printing ink is used. The waterless printing plate PW has image areas and non-image areas which are oleophilic/hydrophilic and oleophobic/hydrophobic, respectively. The waterless printing plate PW is engraved or etched, with the image areas being recessed with respect to the non-image areas. The image area of the waterless printing plate PW is rolled-up with the flexographic or aqueous printing ink which is transferred by the applicator roller **66**. Both aqueous and oil-based inks and coatings are repelled from the non-image areas, and are retained in the image areas. The printing ink or coating is then transferred from the image areas to an ink or coating receptive blanket B and is printed or coated onto a substrate S.

For some printing jobs, a flexographic plate PF or a waterless printing plate PW is mounted over a resilient packing such as the blanket B on the blanket cylinder **34**, for example as indicated by phantom lines in printing unit **22** of FIG. **5**. An advantage of this alternative embodiment is that the waterless plate PW or the flexographic plate PF are resiliently supported over the blanket cylinder by the underlying blanket B or other resilient packing. The radial deflection and give of the resilient blanket B provides uniform, positive engagement between the applicator roller **66** and a flexographic plate or waterless plate.

In that arrangement, a plate is not mounted on the plate cylinder **32**; instead, a waterless plate PW is mounted on the blanket cylinder, and the inked image on the waterless printing plate is not offset but is instead transferred directly from the waterless printing plate PW to the substrate S. The water component of flexographic ink on the freshly printed sheet is evaporated by high velocity, hot air dryers and high volume heat and moisture extractors so that the freshly printed aqueous or flexographic ink is dried before the substrate is printed on the next printing unit.

Referring now to FIG. **2**, FIG. **3** and FIG. **9**, the inking/coating apparatus **10** is pivotally mounted on the side frames **14**, **15** for rotation about an axis X. The inking/coating apparatus **10** includes a frame **60**, a hydraulic motor **62**, a lower gear train **64**, an upper gear train **65**, an applicator roller **66**, a sealed doctor blade assembly **68** (FIG. **6**), and a drip pan DP, all mounted on the frame **60**. The external peripheral surface of the applicator roller **66** is wetted by contact with liquid coating material or ink contained in a reservoir **70**.

The hydraulic motor **62** drives the applicator roller **66** synchronously with the plate cylinder **32** and the blanket cylinder **34** in response to an RPM control signal from the press drive (not illustrated) and a feedback signal developed by a tachometer **72**. While a hydraulic drive motor is preferred, other drive means such as an electric drive motor or an equivalent can be used.

When using waterless printing plate systems, the temperature of the waterless printing ink and of the waterless printing plate must be closely controlled for good image reproduction. For example, for waterless offset printing with TORAY waterless printing plates PW, it is absolutely necessary to control the waterless printing plate surface and waterless ink temperature to a very narrow range, for example 24° C. (75° F.) to 27° C. (80° F.).

Referring to FIG. **7**, the reservoir **70** is supplied with ink or coating which is temperature controlled by a heat exchanger **71**. The temperature controlled ink or coating material is circulated by a positive displacement pump, for example a peristaltic pump, through the reservoir **70** and heat exchanger **71** from a source **73** through a supply conduit **75** and a return conduit **77**. The heat exchanger **71** cools or heats the ink or coating material and maintains the ink or coating and the printing plate within the desired narrow temperature range.

According to one aspect of the present invention, aqueous/flexographic ink or coating material is supplied to the applicator roller **66**, which transfers the aqueous/flexographic ink or coating material to the printing plate (FIG. **7**), which may be a waterless printing plate or a flexographic printing plate. When the inking/coating apparatus is used for applying aqueous/flexographic ink or coating material to a waterless printing plate PW, the inking roller train **52** is not required, and is retracted away from the printing plate. Because the viscosity of aqueous/flexographic printing ink or coating material varies with temperature, it is necessary to heat or cool the aqueous/flexographic printing ink or coating material to compensate for ambient temperature variations to maintain the ink viscosity in a preferred operating range.

For example, the temperature of the printing press can vary from around 60° F. (15° C.) in the morning, to around 85° F. (29° C.) or more in the afternoon. The viscosity of

aqueous/flexographic printing ink or coating material can be marginally high when the ambient temperature of the press is near 60° F. (15° C.), and the viscosity can be marginally low when the ambient temperature of the press exceeds 85° F. (29° C.). Consequently, it is desirable to control the temperature of the aqueous/flexographic printing ink or coating material so that it will maintain the surface temperature of waterless printing plates within the specified temperature range. Moreover, the ink/coating material temperature should be controlled to maintain the tack of the aqueous/flexographic printing ink or coating material within a desired range when the ink or coating material is being used in connection with flexographic printing processes.

The applicator roller **66** is preferably an anilox fluid metering roller which transfers measured amounts of printing ink or coating material to a plate or blanket. The surface of an anilox roller is engraved with an array of closely spaced, shallow depressions referred as "cells". Ink or coating from the reservoir **70** flows into the cells as the anilox roller turns through the reservoir. The transfer surface of the anilox roller is "doctored" (wiped or scraped) by dual doctor blades **68A**, **68B** to remove excess ink or coating material. The ink or coating metered by the anilox roller is that contained within the cells. The dual doctor blades **68A**, **68B** also seal the supply reservoir **70**.

The anilox applicator roller **66** is cylindrical and may be constructed in various diameters and lengths, containing cells of various sizes and shapes. The volumetric capacity of an anilox roller is determined by cell size, shape and number of cells per unit area. Depending upon the intended application, the cell pattern may be fine (many small cells per unit area) or coarse (fewer large cells per unit area).

By supplying the ink or coating material through the inking/coating apparatus **10**, more ink or coating material can be applied to the sheet S as compared with the inking roller train of a lithographic printing unit. Moreover, color intensity is stronger and more brilliant because the aqueous or flexographic ink or coating material is applied at a much heavier film thickness or weight than can be applied by the lithographic process, and the aqueous or flexographic colors are not diluted by dampening solution.

Preferably, the sealed doctor blade assembly **68** is constructed as described in U.S. Pat. No. 5,176,077 to Howard W. DeMoore, co-inventor and assignee, which is incorporated herein by reference. An advantage of using a sealed reservoir is that fast drying ink or coating material can be used. Fast drying ink or coating material can be used in an open fountain **53** (see FIG. **8**); however, open air exposure causes the water and solvents in the fast-drying ink or coating material to evaporate faster, thus causing the ink or coating material to dry prematurely and change viscosity. Moreover, an open fountain emits unwanted odors into the press room. When the sealed doctor blade assembly is utilized, the pump (FIG. 7) which circulates ink or coating material to the doctor blade head is preferably a peristaltic pump, which does not inject air into the feeder lines which supply the ink or coating reservoir **70** and helps to prevent the formation of air bubbles and foam within the ink or coating material.

An inking/coating apparatus **10** having an alternative applicator roller arrangement is illustrated in FIGS. **10–13**. In this arrangement, the engraved metering surface of the anilox applicator rollers **66**, **67** are partitioned by smooth seal surfaces **66C** which separates a first engraved peripheral surface portion **66A** from a second engraved peripheral surface portion **66B**. Likewise, smooth seal surfaces **66D**, **66E** are formed on the opposite end portions of the applicator roller **66** for engaging end seals **134**, **136** (FIG. **12**) of the doctor blade reservoir. The upper applicator roller **67** has engraved anilox metering surfaces **67A** and **67B** which are separated by a smooth seal band **67C**.

Referring now to FIG. **12** and FIG. **13**, the reservoir **70** of the doctor blade head **68** is partitioned by a curved seal element **130** to form two separate chambers **70A**, **70B**. The seal element **130** is secured to the doctor blade head within an annular groove **132**. The seal element **130** is preferably made of polyurethane foam or other durable, resilient foam material. The seal element **130** is engaged by the seal band **66**, thus forming a rotary seal which blocks the leakage of ink or coating material from one reservoir chamber into the other reservoir chamber. Moreover, the seal band provides an unprinted or uncoated area which separates the printed or coated areas from each other, which is needed for work and turn printing jobs or other printing jobs which print two or more separate images onto the same substrate.

Another advantage of the split applicator roller embodiment is that it enables two or more flexographic inks or coating materials to be printed simultaneously within the same lithographic printing unit. That is, the reservoir chambers **70A**, **70B** of the upper doctor blade assembly can be supplied with gold ink and silver ink, for example, while the reservoir chambers **70A**, **70B** of the lower doctor blade assembly can be supplied with inks of two additional colors, for example opaque white ink and blue ink. This permits the opaque white ink to be overprinted with the gold ink, and the blue ink to be overprinted with the silver ink on the same printing unit on any lithographic press.

Moreover, a catalyst can be used in the upper doctor blade reservoir and a reactive ink or coating material can be used in the lower doctor blade reservoir. This can provide various effects, for example improved chemical resistance and higher gloss levels.

The split applicator roller sections **67A**, **67B** in the upper cradle position can be used for applying two separate inks or coating materials simultaneously, for example flexographic, aqueous and ultra-violet curable inks or coating materials, to separate surface areas of the plate, while the lower applicator roller sections **66A**, **66B** can apply an initiator layer and a micro-encapsulated layer simultaneously to separate blanket surface areas. Optionally, the metering surface portions **66A**, **66B** can be provided with different cell metering capacities for providing different printing effects which are being printed simultaneously. For example, the screen line count on one half-section of an anilox applicator roller is preferably in the range of 200–600 lines per inch (79–236 lines per cm) for half-tone images, and the screen line count of the other half-section is preferably in the range of 100–300 lines per inch (39–118 lines per cm) for overall coverage, high weight applications such as opaque white. This split arrangement in combination with dual applicator rollers is particularly advantageous when used in connection with "work and turn" printing jobs.

Referring again to FIG. **8**, instead of using the sealed doctor blade reservoir assembly **68** as shown in FIG. **6**, an open fountain assembly **69** is provided by the fountain pan **53** which contains a volume of liquid ink Q or coating material. The liquid ink or coating material is transferred to the applicator roller **66** by a pan roller **55** which turns in contact with ink Q or coating material in the fountain pan. If a split applicator roller is used, the pan roller **55** is also split, and the pan is divided into two pan sections **53A**, **53B** by a separator plate **53P**, as shown in FIG. **16**.

In the alternative embodiment of FIG. 16, the pan roller 55 is divided into two pan roller sections 55A, 55B by a centrally located, annular groove 59. The separator plate 53P is received within and centrally aligned with the groove 59, but does not touch the adjoining roller faces. By this arrangement, two or more inks or coating materials Q1, Q2 are contained within the open pan sections 55A, 55B for transfer by the split pan roller sections 53A, 53B, respectively. This permits two or more flexographic inks or coating materials to be transferred to two separate image areas on the plate or on the blanket of the same printing unit. This arrangement is particularly advantageous for work and turn printing jobs or other printing jobs which print two or more separate images onto the same substrate.

The frame 60 of the inking/coating apparatus 10 includes side support members 74, 76 which support the applicator roller 66, gear train 64, gear train 65, doctor blade assembly 68 and the drive motor 62. The applicator roller 66 is mounted on stub shafts 63A, 63B which are supported at opposite ends on a lower cradle assembly 100 formed by a pair of side support members 78, 80 which have sockets 79, 81 and retainer caps 101, 103. The stub shafts are received in roller bearings 105, 107 which permit free rotation of the applicator roller 66 about its longitudinal axis A1 (axis A2 in the upper cradle). The retainer caps 101, 103 hold the stub shafts 63A, 63B and bearings 105, 107 in the sockets 79, 81 and hold the applicator roller 66 in parallel alignment with the pivot axis X.

The side support members 74, 76 also have an upper cradle assembly 102 formed by a pair of side support members 82, 84 which are vertically spaced with respect to the lower side plates 78, 80. Each cradle 100, 102 has a pair of sockets 79, 81 and 83, 85, respectively, for holding an applicator roller 66, 67 for spot coating or inking engagement with the printing plate P on the plate cylinder 32 (FIG. 4) or with a printing plate P or a blanket B on the blanket cylinder 34.

Preferably, the applicator roller 67 (FIG. 8, FIG. 9) the upper cradle (plate) position is an anilox roller having a resilient transfer surface. In the dual cradle arrangement as shown in FIG. 2, the press operator can quickly change from blanket inking/coating to plate inking/coating within minutes, since it is only necessary to release, remove and reposition or replace the applicator roller 66.

The capability to simultaneously print in the flexographic mode, the aqueous mode, the waterless mode, or the lithographic mode on different printing units of the same lithographic press and to print or coat from either the plate position or the blanket position on any one of the printing units is referred to herein as the LITHOFLEX™ printing process or system. LITHOFLEX™ is a trademark of Printing Research, Inc. of Dallas, Tex., U.S.A., exclusive licensee of the present invention.

Referring now to FIG. 14, an inking/coating apparatus 10 having an inking/coating assembly 109 of an alternative design is installed in the upper cradle position for applying ink and/or coating material to a plate P on the plate cylinder 32. According to this alternative embodiment, an applicator roller 67R having a resilient transfer surface is coupled to an anilox fluid metering roller which transfers measured amounts of printing ink or coating material to the plate P. The anilox roller 111 has a transfer surface constructed of metal, ceramic or composite material which is engraved with cells. The resilient applicator roller 67R is interposed in transfer engagement with the plate P and the metering surface of the anilox roller 111. The resilient transfer surface of the applicator roller 67R provides uniform, positive engagement with the plate.

Referring now to FIG. 17, an inking/coating apparatus 10 having an alternative inking/coating assembly 113 is installed in the lower cradle assembly 100 for applying flexographic or aqueous ink and/or coating material Q to a plate or blanket mounted on the blanket cylinder 34. Instead of using the sealed, dual doctor blade reservoir assembly 68 as shown in FIG. 6, an open, single doctor blade anilox roller assembly 113 is supplied with liquid ink Q or coating material contained in an open fountain pan 117. The liquid ink or coating material Q is transferred to the engraved transfer surface of the anilox roller 66 as it turns in the fountain pan 117. Excess ink or coating material Q is removed from the engraved transfer surface by a single doctor blade 68B. The liquid ink or coating material Q is pumped from an off-press source, for example the drum 73 shown in FIG. 17, through a supply conduit 119 into the fountain pan 117 by a pump 120.

For overall inking or coating jobs, the metering transfer surface of the anilox roller 66 extends over its entire peripheral surface. However, for certain printing jobs which print two or more separate images onto the same substrate, for example work and turn printing jobs, the metering transfer surface of the anilox applicator roller 66 is partitioned by a centrally located, annular undercut groove 66C which separates first and second metering transfer surfaces 66A, 66B as shown in FIG. 11 and FIG. 18.

The single doctor blade 68B has an edge 68E which wipes simultaneously against the split metering transfer surfaces 66A, 66B. In this single blade, split anilox roller embodiment 113, it is necessary to provide dual supply sources, for example drums 73A, 73B, dual supply lines 119A, 119B, and dual pumps 120A, 120B. Moreover, the fountain pan 117 is also split, and the pan 117 is divided into two pan sections 117A, 117B by a separator plate 121, as shown in FIG. 18. The separator plate 121 is centrally aligned with the undercut groove 66C, but does not touch the adjoining roller faces.

Although the single blade, split anilox applicator roller assembly 113 is shown mounted in the lower cradle position (FIG. 17), it should be understood that the single blade, split anilox applicator roller assembly 113 can be mounted and used in the upper cradle position, as well.

According to another aspect of the present invention, the inking/coating apparatus 10 is pivotally coupled on horizontal pivot pins 88P, 90P which allows the single head, dual cradle inking/coating apparatus 10 to be mounted on any lithographic printing unit. Referring to FIG. 9, the horizontal pivot pins 88P, 90P are mounted within the traditional dampener space 29 of the printing unit and are secured to the press side frames 14, 15, respectively. Preferably, the pivot support pins 88P, 90P are secured to the press side frames by a threaded fastener. The pivot support pins are received within circular openings 88, 90 which intersect the side support members 74, 76 of the inking/coating apparatus 10. The horizontal support pins 88P, 90P are disposed in parallel alignment with rotational axis X and with the plate cylinder and blanket cylinder, and are in longitudinal alignment with each other.

Preferably, the pivot pins 88P, 90P are located in the dampener space 29 so that the rotational axes A1, A2 of the applicator rollers 66, 67 are elevated with respect to the nip contact points N1, N2. By that arrangement, the transfer point between the applicator roller 66 and a blanket on the blanket cylinder 34 (as shown in FIG. 8) and the transfer

point between the applicator roller **66** and a plate on the plate cylinder **32** (as shown in FIG. 5) are above the radius lines R1, R2 of the plate cylinder and the blanket cylinder, respectively. This permits the inking/coating apparatus **10** to move clockwise to retract the applicator roller **66** to an off-impression position relative to the blanket cylinder in response to a single extension stroke of the power actuator arms **104A**, **106A**. Similarly, the applicator roller **66** is moved counterclockwise to the on-impression operative position as shown in FIGS. **4**, **5**, **6** and **8** by a single retraction stroke of the actuator arms **104A**, **106A**, respectively.

Preferably, the pivot pins are made of steel and the side support members are made of aluminum, with the steel pivot pins and the aluminum collar portion bordering the circular openings **88**, **90** forming a low friction journal. By this arrangement, the inking/coating apparatus **10** is freely rotatable clockwise and counterclockwise with respect to the pivot pins **88P**, **90P**. Typically, the arc length of rotation is approximately 60 mils (about 1.5 mm). Consequently, the inking/coating apparatus **10** is almost totally enclosed within the dampener space **29** of the printing unit in the on-impression position and in the off-impression position.

The cradle assemblies **100** and **102** position the applicator roller **66** in inking/coating alignment with the plate cylinder or blanket cylinder, respectively, when the inking/coating apparatus **10** is extended to the operative (on-impression) position. Moreover, because the inking/coating apparatus **10** is installed within the dampener space **29**, it is capable of freely rotating through a small arc while extending and retracting without being obstructed by the press side frames or other parts of the printing press. This makes it possible to install the inking/coating apparatus **10** on any lithographic printing unit. Moreover, because of its internal mounting position within the dampener space **29**, the projection of the inking/coating apparatus **10** into the space between printing units is minimal. This assures unrestricted operator access to the printing unit when the applicator head is in the operative (on-impression) and retracted (off-impression) positions.

As shown in FIG. 4 and FIG. 5, movement of the inking/coating apparatus **10** is counterclockwise from the retracted (off-impression) position to the operative (on-impression) position.

Although the dampener side installation is preferred, the inking/coating apparatus **10** can be adapted for operation on the delivery side of the printing unit, with the inking/coating apparatus being movable from a retracted (off-impression) position to an on-impression position for engagement of the applicator roller with either a plate on the plate cylinder or a blanket on the blanket cylinder on the delivery side **25** of the printing unit.

Movement of the inking/coating apparatus **10** to the operative (on-impression) position is produced by power actuators, preferably double acting pneumatic cylinders **104**, **106** which have extendable/retractable power transfer arms **104A**, **106A**, respectively. The first pneumatic cylinder **104** is pivotally coupled to the press frame **14** by a pivot pin **108**, and the second pneumatic cylinder **106** is pivotally coupled to the press frame **15** by a pivot pin **110**. In response to selective actuation of the pneumatic cylinders **104**, **106**, the power transfer arms **104A**, **106A** are extended or retracted. The power transfer arm **104A** is pivotally coupled to the side support member **74** by a pivot pin **112**. Likewise, the power transfer arm **106A** is pivotally coupled to the side support member **76** by a pivot pin **114**.

As the power arms extend, the inking/coating apparatus **10** is rotated clockwise on the pivot pins **88P**, **90P**, thus moving the applicator roller **66** to the off-impression position. As the power arms retract, the inking/coater apparatus **60** is rotated counterclockwise on the pivot pins **88P**, **90P**, thus moving the applicator roller **66** to the on-impression position. The torque applied by the pneumatic actuators is transmitted to the inking/coating apparatus **10** through the pivot pin **112** and pivot pin **114**.

Fine adjustment of the on-impression position of the applicator roller relative to the plate cylinder or the blanket cylinder, and of the pressure of roller engagement, is provided by an adjustable stop assembly **115**. The adjustable stop assembly **115** has a threaded bolt **116** which is engagable with a bell crank **118**. The bell crank **118** is pivotally coupled to the side support member **74** on a pin **120**. One end of the bell crank **118** is engagable by the threaded bolt **116**, and a cam roller **122** is mounted for rotation on its opposite end. The striking point of engagement is adjusted by rotation of the bolt **116** so that the applicator roller **66** is properly positioned for inking/coating engagement with the plate P or blanket B and provides the desired amount of inking/coating pressure when the inking/coating assembly **60** is moved to the operative position.

This arrangement permits the in-line inking/coating apparatus to operate effectively without encroaching in the interunit space between any adjacent printing units, and without blocking or obstructing access to the cylinders of the printing units when the inking/coating apparatus is in the extended (off-impression) position or retracted (on-impression) position. Moreover, when the in-line inking/coating apparatus is in the retracted position, the doctor blade reservoir and coating circulation lines can be drained and flushed automatically while the printing press is running as well as when the press has been stopped for change-over from one job to another or from one type of ink or coating to another.

Substrates which are printed or coated with aqueous flexographic printing inks require high velocity hot air for drying. When printing a flexographic ink such as opaque white or metallic gold, it is always necessary to dry the printed substrates between printing units before overprinting them. According to the present invention, the water component on the surface of the freshly printed or coated substrate S is evaporated and dried by high velocity, hot air interunit dryer and high volume heat and moisture extractor units **124**, **126** and **128**, as shown in FIG. 2, FIG. 4 and FIG. 5. The dryer/extractor units **124**, **126** and **128** are oriented to direct high velocity heated air onto the freshly printed/coated substrates as they are transferred by the impression cylinder **36** and the intermediate transfer drum **40** of one printing unit and to another transfer cylinder **30** and to the impression cylinder **36** of the next printing unit. By that arrangement, the freshly printed flexographic ink or coating material is dried before the substrate S is overprinted by the next printing unit.

The high velocity, hot air dryer and high performance heat and moisture extractor units **124**, **126** and **128** utilize high velocity air jets which scrub and break-up the moist air layer which clings to the surface of each freshly printed or coated sheet or web. Within each dryer, high velocity air is heated as it flows across a resistance heating element within an air delivery baffle tube. High velocity jets of hot air are discharged through multiple airflow apertures into an exposure zone Z (FIG. 4 and FIG. 5) and onto the freshly printed/coated sheet S as it is transferred by the impression cylinder **36** and transfer drum **40**, respectively.

Each dryer assembly includes a pair of air delivery dryer heads **124D**, **126D** and **128D** which are arranged in spaced,

side-by-side relationship. The high velocity, hot air dryer and high performance heat and moisture extractor units **124**, **126** and **128** are preferably constructed as disclosed in co-pending U.S. patent application Ser. No. 08/132,584, filed Oct. 6, 1993, entitled "High Velocity Hot Air Dryer", to Howard W. DeMoore, co-inventor and assignee of the present invention, and which is incorporated herein by reference, and which is marketed by Printing Research, Inc. of Dallas, Tex., U.S.A., under its trademark SUPER BLUE HV™.

The hot moisture-laden air displaced from the surface of each printed or coated sheet is extracted from the dryer exposure zone Z and exhausted from the printing unit by the high volume extractors **124**, **126** and **128**. Each extractor head includes an extractor manifold **124E**, **126E** and **128E** coupled to the dryer heads **124D**, **126D** and **128D** and draws the moisture, volatiles, odors and hot air through a longitudinal air gap G between the dryer heads. Best results are obtained when extraction is performed simultaneously with drying. Preferably, an extractor is closely coupled to the exposure zone Z at each dryer location as shown in FIG. **4**. Extractor heads **124E**, **126E** and **128E** are mounted on the dryer heads **124D**, **126D** and **128D**, respectively, with the longitudinal extractor air gap G facing directly into the exposure zone Z. According to this arrangement, each printed or coated sheet is dried before it is printed on the next printing unit.

The aqueous water-based inks used in flexographic printing evaporate at a relatively moderate temperature provided by the interunit high velocity hot air dryers/extractors **124**, **126** and **128**. Sharpness and print quality are substantially improved since the flexographic ink or coating material is dried before it is overprinted on the next printing unit. Since the freshly printed flexographic ink is dry, dot gain is substantially reduced and back-trapping on the blanket of the next printing unit is virtually eliminated. This interunit drying/extracting arrangement makes it possible to print flexographic inks such as metallic ink and opaque white ink on the first printing unit, and then dry-trap and overprint on the second and subsequent printing units.

Moreover, this arrangement permits the first printing unit **22** to be used as a coater in which a flexographic, aqueous or UV-curable coating material is applied to the lowest grade substrate such as recycled paper, cardboard, plastic and the like, to trap and seal-in lint, dust, spray powder and other debris and provide a smoother, more durable printing surface which can be overprinted on the next printing unit.

A first down (primer) aqueous coating layer seals-in the surface of a low grade, rough substrate, for example, recycled paper or plastic, and improves overprinted dot definition and provides better ink lay-down while preventing strike-through and show-through. A flexographic UV-curable coating material can then be applied downstream over the primer coating, thus producing higher coating gloss.

Preferably, the applicator roller **66** is constructed of composite carbon fiber material, metal or ceramic coated metal when it is used for applying ink or coating material to the blanket B or other resilient material on the blanket cylinder **34**. When the applicator roller **66** is applied to the plate, it is preferably constructed as an anilox roller having a resilient, compressible transfer surface. Suitable resilient roller surface materials include Buna N synthetic rubber and EPDM (terpolymer elastomer).

It has been demonstrated in prototype testing that the inking/coating apparatus **10** can apply a wide range of ink and coating types, including fluorescent (Day Glo), pearlescent, metallics (gold, silver and other metals), glitter, scratch and sniff (micro-encapsulated fragrance), scratch and reveal, luminous, pressure-sensitive adhesives and the like, as well as UV-curable and aqueous coatings.

With the dampener assembly removed from the printing unit, the inking/coating apparatus **10** can easily be installed in the dampener space for selectively applying flexographic inks and/or coatings to a flexographic or waterless printing plate or to the blanket. Moreover, overprinting of the flexographic inks and coatings can be performed on the next printing unit since the flexographic inks and/or coatings are dried by the high velocity, hot air interunit dryer and high volume heat and moisture extractor assembly of the present invention.

The flexographic inks and coatings as used in the present invention contain colored pigments and/or soluble dyes, binders which fix the pigments onto the surface of the substrate, waxes, defoamers, thickeners and solvents. Aqueous printing inks predominantly contain water as a diluent and/or vehicle. The thickeners which are preferred include algonates, starch, cellulose and its derivatives, for example cellulose esters or cellulose ethers and the like. Coloring agents including organic as well as inorganic pigments may be derived from dyes which are insoluble in water and solvents. Suitable binders include acrylates and/or polyvinylchloride.

When metallic inks are printed, the cells of the anilox roller must be appropriately sized to prevent the metal particles from getting stuck within the cells. For example, for metallic gold ink, the anilox roller should have a screen line count in the range of 175–300 lines per inch (68–118 lines per cm). Preferably, in order to keep the anilox roller cells clear, the doctor blade assembly **68** is equipped with a bristle brush BR (FIG. 14) as set forth in U.S. Pat. No. 5,425,809 to Steven M. Person, assigned to Howard W. DeMoore, and licensed to Printing Research, Inc. of Dallas, Tex., U.S.A., which is incorporated herein by reference.

The inking/coating apparatus **10** can also apply UV-curable inks and coatings. If UV-curable inks and coatings are utilized, ultra-violet dryers/extractors are installed adjacent to the high velocity hot air dryer/extractor units **124**, **126** and **128**, respectively.

It will be appreciated that the LITHOFLEX™ printing process described herein makes it possible to selectively operate a printing unit of a press in the lithographic printing mode while simultaneously operating another printing unit of the same press in either the flexographic printing mode or in the waterless printing mode, while also providing the capability to print or coat, separately or simultaneously, from either the plate position or the blanket position. The dual cradle support arrangement of the present invention makes it possible to quickly change over from inking/coating on the blanket cylinder position to inking/coating on the plate cylinder position with minimum press down-time, since it is only necessary to remove and reposition or replace the applicator roller **66** while the inking/coating apparatus **10** is in the retracted position. It is only necessary to remove four cap screws, lift the applicator roller **66** from the cradle, and reposition it in the other cradle. All of this can be accomplished in a few minutes, without removing the inking/coating apparatus **10** from the press.

It is possible to spot coat or overall coat from the plate position or from the blanket position with flexographic inks or coatings on one printing unit and then spot coat or overall coat with UV-curable inks or coatings from the plate position or from the blanket position on another printing unit

during the same press run. Moreover, the press operator can spot or overall coat from the plate for one job, and then spot and/or overall coat from the blanket on the next job.

The positioning of the applicator roller relative to the plate or blanket is repeatable to a predetermined preset operative position. Consequently, only minor printing unit modifications or alterations may be required for the LITHOFLEX™ process. Although automatic extension and retraction have been described in connection with the exemplary embodiment, extension to the operative (on-impression) position and retraction to a non-operative (off-impression) position can be carried out manually, if desired. In the manual embodiment, it is necessary to latch the inking/coating apparatus **10** to the press side frames **14, 15** in the operative (on-impression) position, and to mechanically prop the inking/coating apparatus in the off-impression (retracted) position.

Referring again to FIG. **8**, an applicator roller **66** is mounted on the lower cradle assembly **100** by side support members **78, 80**, and a second applicator roller **66** is mounted on the upper cradle assembly **102** by side support members **82, 84**. According to this arrangement, the inking/coating apparatus **10** can apply printing ink and/or coating material to a plate on the plate cylinder, while simultaneously applying printing ink and/or coating material to a plate or a blanket on the blanket cylinder of the same printing unit. When the same color ink is used by the upper and lower applicator rollers from the plate position and from the blanket position simultaneously on the same printing unit, a "double bump" or double inking films or coating layers are applied to the substrate S during a single pass of the substrate through the printing unit. The tack of the two inks or coating materials must be compatible for good transfer during the double bump. Moreover, the inking/coating apparatus **10** can be used for supplying ink or coating material to the blanket cylinder of a rotary offset web press, or to the blanket of a dedicated coating unit.

According to conventional bronzing techniques, a metallic (bronze) powder is applied off-line to previously printed substrate which produces a grainy, textured finish or appearance. The on-line application of bronze material by conventional flexographic or lithographic printing will only produce a smooth, continuous appearance. However, a grainy, textured finish is preferred for highest quality printing which, prior to the present invention, could only be produced by off-line methods.

Referring now to FIG. **14** and FIG. **15**, metallic ink or coating material is applied on-line to the substrate S by simultaneous operation of the upper and lower applicator rollers **67R, 66** to produce an uneven surface finish having a bronze-like textured or grainy appearance. According to the simulated bronzing method of the present invention, the flexographic bronze ink is applied simultaneously to the plate and to the blanket by the dual cradle inking/coating apparatus **10** as shown in FIG. **14**. A resilient applicator roller **67R** is mounted in the upper cradle **102**, and an anilox applicator roller **66** is mounted on the lower cradle **100**. The rollers are supplied from separate doctor blade reservoirs **70**. The doctor blade reservoir **70** in the upper cradle position supplies bronze ink or coating material having relatively coarse, metallic particles **140** dispersed in aqueous or flexographic ink. The coarse particle ink or coating material is applied to the plate P by the resilient applicator roller **67R** in the upper cradle position **102**. At the same time, flexographic and/or bronze ink or coating material having relatively fine, metallic particles **142** is transferred to the blanket B by the anilox roller **66** which is mounted on the lower cradle **100**.

The metering surfaces of the upper and lower applicator rollers have different cell sizes and volumetric capacities which accommodate the coarse and fine metallic particles. For example, the anilox roller **111** mounted in the upper cradle position **102** which transfers the coarse metallic particles **140** preferably has a screen line count in the range of 100–300 lines per inch (39–118 lines per cm), and the metering surface of the anilox roller **66** mounted on the lower cradle **100** which transfers the relatively fine metallic particles **142** preferably has a screen line count in the range of 200–600 lines per inch (79–236 lines per cm).

After transfer from the plate to the blanket, the fine metallic particles **142** form a layer over the coarse metallic particles **140**. As both bronze layers are offset onto the substrate S, the layer of fine metallic particles **142** is printed onto the substrate S with the top layer of coarse metallic particles **140** providing a textured, grainy appearance. The fine metallic particles **142** cover the substrate which would otherwise be visible in the gaps between the coarse metallic particles **140**. The combination of the coarse particle layer over the fine particle layer thus provides a textured, bronzed-like finish and appearance.

Particulate materials other than metal can be used for producing a textured finish. For example, coarse and fine particles of metallized plastic (glitter), mica particles (pearlescent) and the like, can be substituted for the metallic particles for producing unlimited surface variations, appearances and effects. All of the particulate material, including the metallic particles, are preferably in solid, flat platelet form, and have a size dimension suitable for application by an anilox applicator roller. Other particulate or granular material, for example stone grit having irregular form and size, can be used to good advantage.

Solid metal particles in platelet form, which are good reflectors of light, are preferred for producing the bronzed-like appearance and effect. However, various textured finishes, which could have light-reflective properties, can be produced by using granular materials such as stone grit. Most commonly used metals include copper, zinc and aluminum. Other ductile metals can be used, if desired. Moreover, the coarse and fine particles need not be made of the same particulate material. Various effects and textured appearances can be produced by utilizing diverse particulate materials for the coarse particles and the fine particles, respectively. Further, either fine or coarse particle ink or coating material can be printed from the upper cradle position, and either fine or coarse particle ink or coating material can be printed from the lower cradle position, depending on the special or surface finish that is desired.

It will be appreciated that the last printing unit **28** can be configured for additional inking/coating capabilities which include lithographic, waterless, aqueous and flexographic processes. Various substrate surface effects (for example double bump or triple bump inking/coating or bronzing) can be performed on the last printing unit. For triple bump inking/coating, the last printing unit **28** is equipped with an auxiliary in-line inking or coating apparatus **97** as shown in FIG. **3** and FIG. **4**. The in-line inking or coating apparatus **97** allows the application of yet another film of ink or a protective or decorative layer of coating material over any freshly printed or coated surface effects or special treatments, thereby producing a triple bump. The triple bump is achieved by applying a third film of ink or layer of coating material over the freshly printed or coated double bump simultaneously while the substrate is on the impression cylinder of the last printing unit.

When the in-line inking/coating apparatus **97** is installed, it is necessary to remove the SUPER BLUE® flexible

covering from the delivery cylinder 42, and it is also necessary to modify or convert the delivery cylinder 42 for inking/coating service by mounting a plate or blanket B on the delivery cylinder 42, as shown in FIG. 3 and FIG. 4. Packing material is placed under the plate or blanket B, thereby packing the plate or blanket B at the correct packed-to-print radial clearance so that ink or coating material will be printed or coated onto the freshly printed substrate S as it transfers through the nip between the plate or blanket B on the converted delivery cylinder 42 and the last impression cylinder 36. According to this arrangement, a freshly printed or coated substrate is overprinted or overcoated with a third film or layer of ink or coating material simultaneously while a second film or layer of ink or coating material is being over-printed or over-coated on the last impression cylinder 36.

The auxiliary inking/coating apparatus 97 and the converted or modified delivery cylinder 42 are mounted on the delivery drive shaft 43. The inking/coating apparatus 97 includes an applicator roller, preferably an anilox applicator roller 97A, for supplying ink or coating material to a plate or blanket B on the modified or converted delivery cylinder 42. The in-line inking/coating apparatus 97 and the modified or converted delivery cylinder 42 are preferably constructed as described in U.S. Pat. No. 5,176,077 to Howard W. DeMoore (co-inventor and assignee), which is hereby incorporated by reference. The in-line inking/coating apparatus 97 is manufactured and sold by Printing Research, Inc. of Dallas, Tex., U.S.A., under its trademark SUPER BLUE EZ COATER™.

After the delivery cylinder 42 has been modified or converted for inking/coating service, and because of the reduced nip clearance imposed by the plate or blanket B, the modified delivery cylinder 42 can no longer perform its original function of guiding and transferring the freshly printed or coated substrate. Instead, the modified or converted delivery cylinder 42 functions as a part of the inking/coating apparatus 97 by printing or coating a third down film of ink or layer of coating material onto the freshly printed or coated substrate as it is simultaneously printed or coated on the last impression cylinder 36. Moreover, the mutual tack between the second down ink film or coating layer and the third down ink film or coating layer causes the overprinted or overcoated substrate to cling to the plate or blanket, thus opposing or resisting separation of the substrate from the plate or blanket.

To remedy this problem, a vacuum-assisted transfer apparatus 99 is mounted adjacent the modified or converted delivery cylinder 42 as shown in FIG. 3 and FIG. 4. Another purpose of the vacuum-assisted transfer apparatus 99 is to separate the freshly overprinted or overcoated triple bump substrate from the plate or blanket B as the substrate transfers through the nip. The vacuum-assisted transfer apparatus 99 produces a pressure differential across the freshly overprinted or overcoated substrate as it transfers through the nip, thus producing a separation force onto the substrate and providing a clean separation from the plate or blanket B.

The vacuum-assisted transfer apparatus 99 is preferably constructed as described in U.S. Pat. Nos. 5,113,255; 5,127,329; 5,205,217; 5,228,391; 5,243,909; and 5,419,254, all to Howard W. DeMoore, co-inventor, which are incorporated herein by reference. The vacuum-assisted transfer apparatus 99 is manufactured and sold by Printing Research, Inc. of Dallas, Tex., U.S.A. under its trademark BACVAC™.

Although the present invention and its advantages have been described in detail, it should be understood that various changes, substitutions and alterations can be made herein without departing from the spirit and scope of the present invention as defined by the appended claims.

What is claimed is:

1. A rotary offset printing press of the type including first and second printing units, the first printing unit comprising:

a plate cylinder having a flexographic printing plate mounted thereon;

a blanket cylinder having a blanket disposed in ink or coating transfer engagement with the flexographic printing plate for receiving aqueous or flexographic printing ink or coating material from the flexographic printing plate;

an impression cylinder disposed adjacent the blanket cylinder thereby forming a nip between the blanket and the impression cylinder whereby the aqueous or flexographic printing ink or coating material can be transferred from the blanket to a substrate as the substrate is transferred through the nip;

inking/coating apparatus movably coupled to the first printing unit for movement to an on-impression operative position and to an off-impression retracted position;

the inking/coating apparatus including container means for containing a volume of aqueous or flexographic ink or coating material, and at least one applicator roller coupled to the container means for applying aqueous or flexographic ink or coating material to the flexographic printing plate or to the blanket when the inking/coating apparatus is in the on-impression operative position;

the container means having a partition dividing the container means thereby defining a first container region and a second container region;

the at least one applicator roller having first and second transfer surfaces and means separating the first and second transfer surfaces; and,

the first and second transfer surfaces of the at least one applicator roller being disposed within the first and second container regions for rolling contact with aqueous or flexographic printing ink or coating material contained within the first and second container regions, respectively.

2. A rotary offset printing press as defined in claim 1, wherein:

said separating means is an annular seal element disposed on the applicator roller; and,

the partition is disposed in sealing engagement against the annular seal element of the applicator roller.

3. A rotary offset printing press as defined in claim 1, wherein:

said container means is an open fountain pan;

said separating means is an annular groove intersecting the applicator roller thereby separating the first and second transfer surfaces; and,

the partition is a separator plate mounted on the fountain pan between the first and second container regions and disposed in the annular groove.

4. A rotary offset printing press as defined in claim 1, including sheet feeding means coupled to the first printing unit for consecutively feeding substrates in sheet form into the first printing unit.

5. A rotary offset printing press as defined in claim 1, including web feeding means coupled to the first printing unit for continuously feeding a substrate in continuous web form into the first printing unit.

6. A rotary offset printing press as defined in claim 1, wherein:

said container means is a fountain pan having first and second pan sections for containing first and second aqueous or flexographic inks or coating materials, respectively; and,

said at least one applicator roller is a pan roller mounted for rotation in the first and second pan sections, respectively, for separately transferring aqueous or flexographic ink or coating material from the first and second pan sections to the first and second transfer surfaces of the applicator roller.

7. A rotary offset printing press as set forth in claim 1, wherein:

said container means is a sealed doctor blade head, said partition being mounted on the doctor blade head and separating the first and second container regions;

the at least one applicator roller comprising an anilox transfer roller;

the separating means being a seal band formed on the applicator roller between the first and second transfer surfaces; and,

the partition being disposed in sealing engagement with the seal band in the coupled position.

8. A rotary offset printing press as defined in claim 1, wherein the inking/coating apparatus comprises:

first cradle means for supporting the at least one applicator roller for engagement with a plate or blanket when the inking/coating apparatus is in the operative position;

second cradle means for supporting a second applicator roller for engagement with a plate or blanket when the inking/coating apparatus is in the operative position;

the at least one applicator roller being mounted for rotation on the first cradle means, the at least one applicator roller having a first seal band separating first and second transfer surfaces;

the second applicator roller being mounted for rotation on the second cradle means, the second applicator roller having a second seal band separating the third and fourth transfer surfaces;

the container means including:

first reservoir means for containing a volume of ink or coating material, the first reservoir means having first and second reservoir chambers and a first partition separating the first and second reservoir chambers;

second reservoir means for containing a volume of ink or coating material, the second reservoir means having third and fourth reservoir chambers and a second partition element separating the third and fourth reservoir chambers;

the first and second reservoir means being coupled to the at least one and second applicator rollers, respectively, the first and second transfer surfaces of the at least one applicator roller being disposed for rolling contact with ink or coating material in the first and second reservoir chambers, respectively, of the first reservoir means and the first partition being disposed in sealing engagement with the separating means of the first applicator roller; and,

the third and fourth transfer surfaces of the second applicator roller being disposed for rolling contact with ink or coating material in the third and fourth reservoir chambers, respectively, of the second reservoir means and the second partition being disposed in sealing engagement with the separating means of the second applicator roller.

9. A rotary offset printing press as defined in claim 1, wherein:

the at least one applicator roller is an anilox roller; and,

the volumetric capacity of the first transfer surface being different from the volumetric capacity of the second transfer surface.

10. A rotary offset printing press as defined in claim 1, wherein the inking/coating apparatus comprises:

cradle means;

the at least one applicator roller being mounted for rotation on the cradle means; and,

the volumetric capacity of the first transfer surface being different from the volumetric capacity of the second transfer surface.

11. A rotary offset printing press as defined in claim 1, further including:

a transfer drum coupled in substrate transfer relation with the impression cylinder of the first printing unit and in substrate transfer relation with the second printing unit;

a first dryer mounted adjacent the impression cylinder of the first printing unit for discharging heated air onto a freshly printed or coated substrate while the substrate is in contact with the impression cylinder of the first printing unit;

a second dryer mounted adjacent the transfer drum for discharging heated air onto a freshly printed or coated substrate after it has been transferred from the impression cylinder of the first printing unit and while it is in contact with the transfer cylinder; and,

a third dryer disposed adjacent the second printing unit for discharging heated air onto a freshly printed or coated substrate after it has been transferred from the transfer drum and before it is printed or otherwise processed on the second printing unit.

12. A rotary offset printing press as defined in claim 1, wherein the inking/coating apparatus comprises:

first cradle means;

a first reservoir or fountain means mounted on the first cradle means for containing ink or coating material;

a first applicator roller mounted for rotation on the first cradle means and disposed for rolling contact with ink or coating material in the first reservoir or fountain means, the first applicator roller being engagable with a printing plate on the plate cylinder;

second cradle means;

a second reservoir or fountain means mounted on the second cradle means for receiving ink or coating material; and,

a second applicator roller mounted for rotation on the second cradle means and disposed for rolling contact with ink or coating material in the second reservoir or fountain means, the second applicator roller being engagable with a printing plate or blanket mounted on the blanket cylinder in the operative position.

13. A rotary offset printing press as defined in claim 1, wherein the inking/coating apparatus has an axis of rotation and is pivotally mounted on the first printing unit in a position in which the nip contact point between said at least one applicator roller and a blanket or plate is offset with respect to a radius line projecting through the center of the plate cylinder or blanket cylinder to the axis of rotation of the inking/coating apparatus.

14. A rotary offset printing press as defined in claim 1, further including:

a supply container for containing a volume of liquid ink or coating material;

circulation means coupled between the supply container and the inking/coating apparatus for inducing the flow of liquid ink or coating material from said supply container to the inking/coating apparatus and for returning liquid ink or coating material from the inking/coating apparatus to the supply container; and,

heat exchanger means coupled to the circulation means for maintaining the temperature of the liquid ink or coating material within a predetermined temperature range.

15. A printing press as defined in claim 1, wherein the inking/coating apparatus has an axis of rotation and is pivotally mounted on the first printing unit in a position in which the nip contact point between the at least one applicator roller and the blanket or the printing plate is offset with respect to a radius line projecting through the center of the plate cylinder or blanket cylinder to the axis of rotation of the inking/coating apparatus.

16. A printing press as defined in claim 1, including:

a dryer mounted on the first printing unit for discharging heated air onto a freshly printed or coated substrate before the freshly printed or coated substrate is subsequently printed, coated or otherwise processed on the second printing unit.

17. A printing press as defined in claim 16, wherein:

the dryer is mounted adjacent the impression cylinder of the first printing unit for discharging heated air onto a freshly printed or coated substrate while the substrate is in contact with said impression cylinder.

18. A printing press as defined in claim 1, further including:

a substrate transfer apparatus disposed in an interunit position on the printing press and coupled in substrate transfer relation with the impression cylinder of the first printing unit;

an interunit dryer disposed adjacent the substrate transfer apparatus for discharging heated air onto a freshly printed or coated substrate after it has been transferred from the first printing unit and while it is in contact with the substrate transfer apparatus.

19. A printing press as defined in claim 1, comprising:

a dryer mounted on the first printing unit for discharging heated air onto a freshly printed or coated substrate; and,

an extractor coupled to the dryer for extracting hot air and moisture vapors from an exposure zone between the dryer and the freshly printed or coated substrate.

* * * * *

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United States Patent [19]

Satterwhite

[11] **4,308,796**

[45] **Jan. 5, 1982**

[54] **OFFSET LITHOGRAPHIC PRESS WITH INK METERING SYSTEM FOR BLANKET CYLINDER**

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[73] Assignee: **S-W-H, Ltd.**, St. Louis, Mo.

[21] Appl. No.: **57,327**

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[51] **Int. Cl.**[3] **B41F 31/06**; B41F 31/12; B41F 31/36

[52] **U.S. Cl.** **101/143**; 101/144; 101/351; 101/352; 101/217; 118/261; 118/46

[58] **Field of Search** 101/350, 351, 352, 349, 101/363, 364, 348, 247, 206, 207, 208, 209, 210, 217, 218, 148, 142, 143, 144; 118/258, 46, 262, 263

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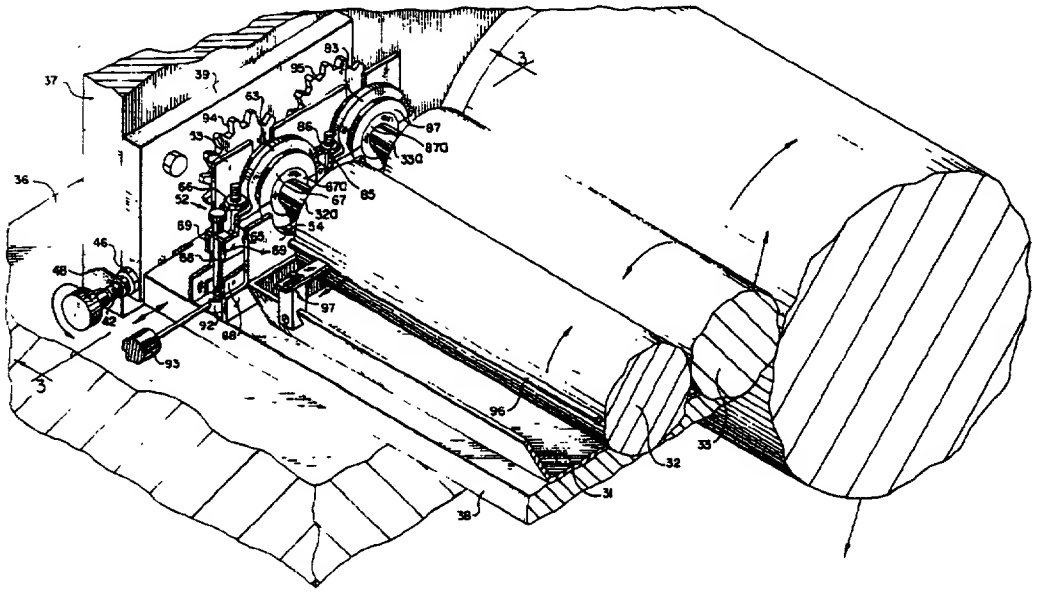
Attorney, Agent, or Firm—Thomas L. Cantrell; Joseph H. Schley; Stanley R. Moore

[57] **ABSTRACT**

Disclosed are improved methods and apparatus for printing, including equipment for adapting an offset press so that it may be operated flexographically, either to coat stock or print on it, without impairing the function of the press as an offset press. In addition, the equipment improves the application of two-part inks or catalyst set inks and permits simultaneous printing and coating of stock. The equipment includes a pair of rollers and an ink pan, as well as drive means for the rollers, and mounting means for bringing one of the rollers into ink transfer contact with the blanket roll of an offset press. The mounting means includes quick-release collars for easy removal of the rollers from the press when they are not needed, and for maintenance.

4 Claims, 7 Drawing Figures



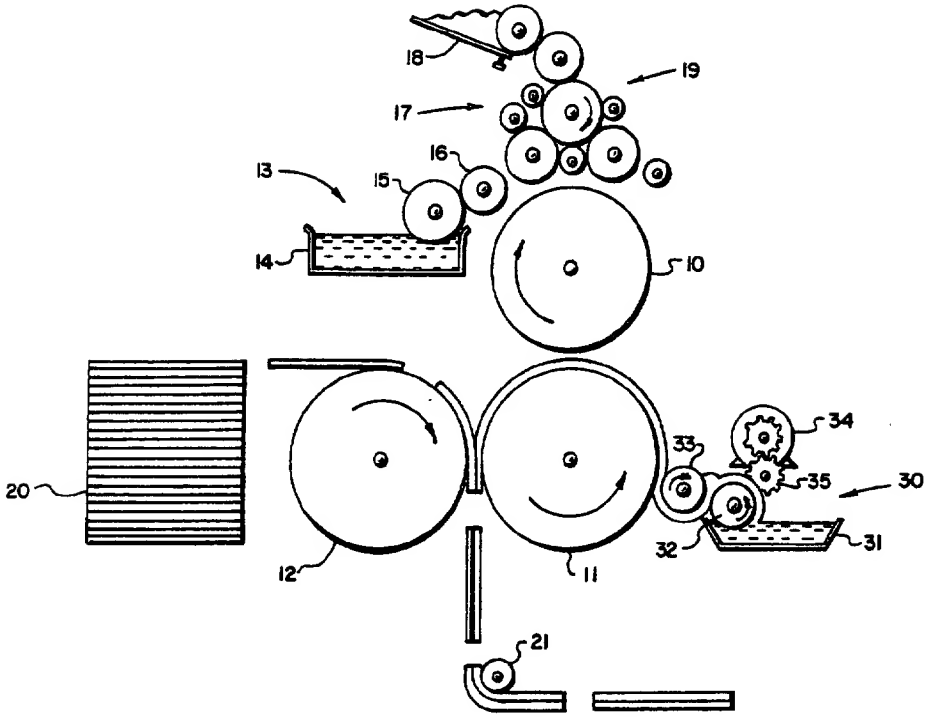

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FIG. 1

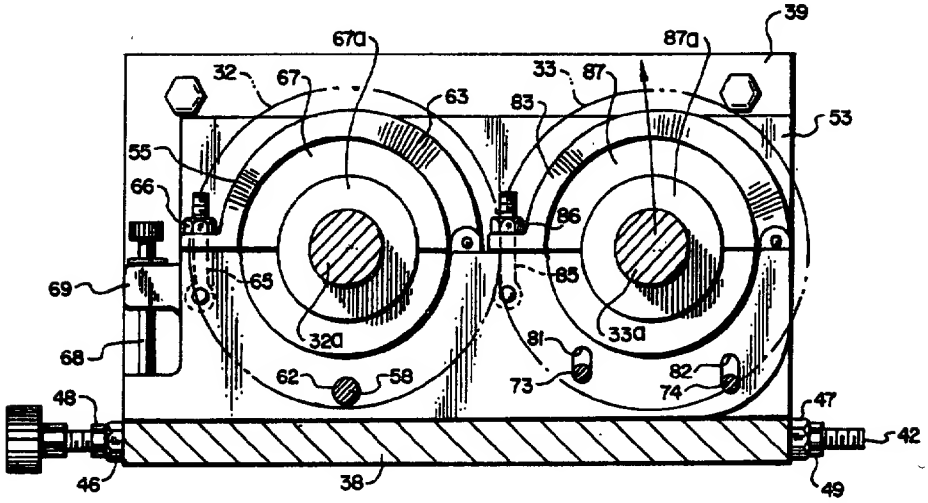
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FIG. 3

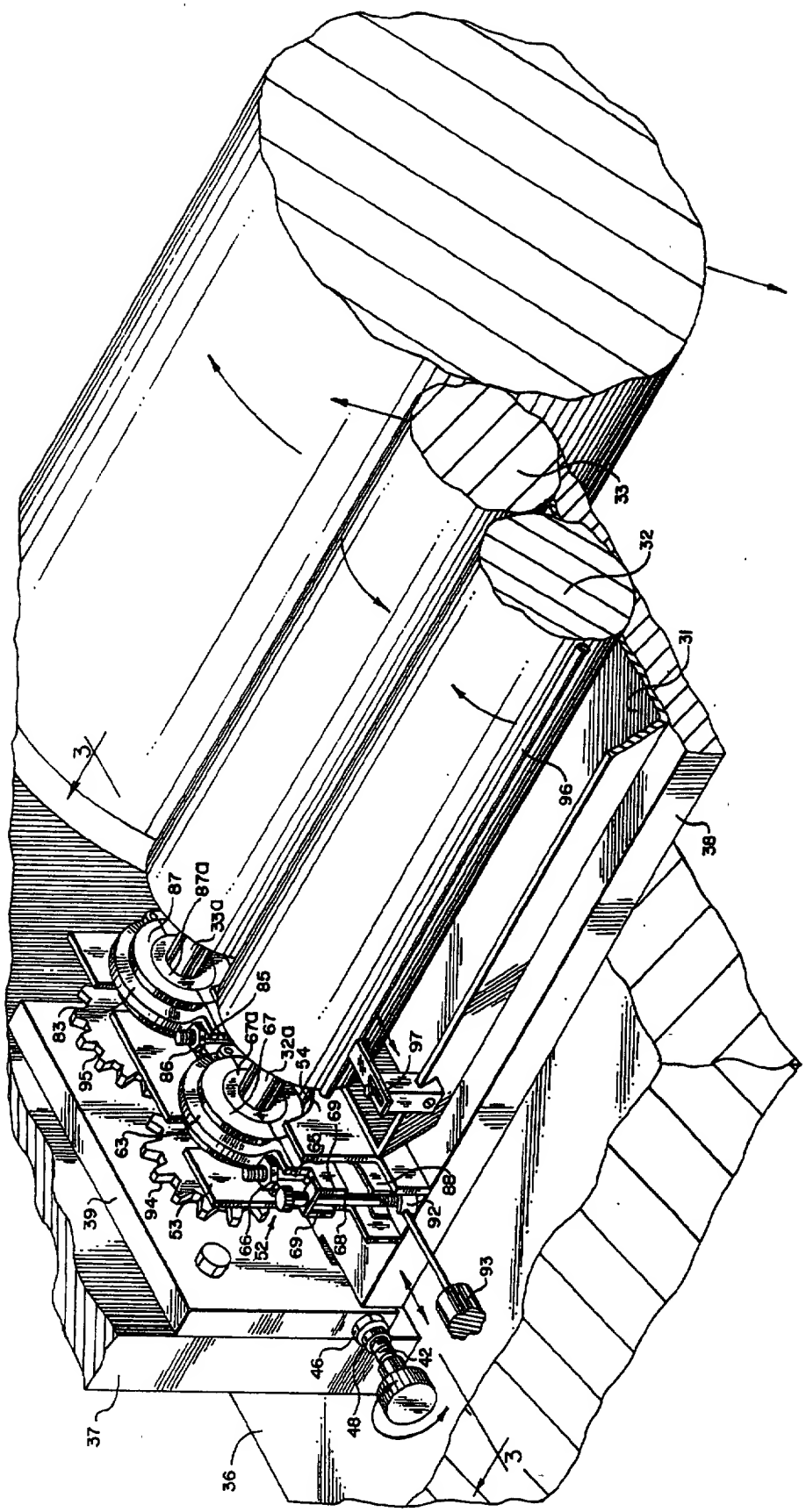
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FIG. 2

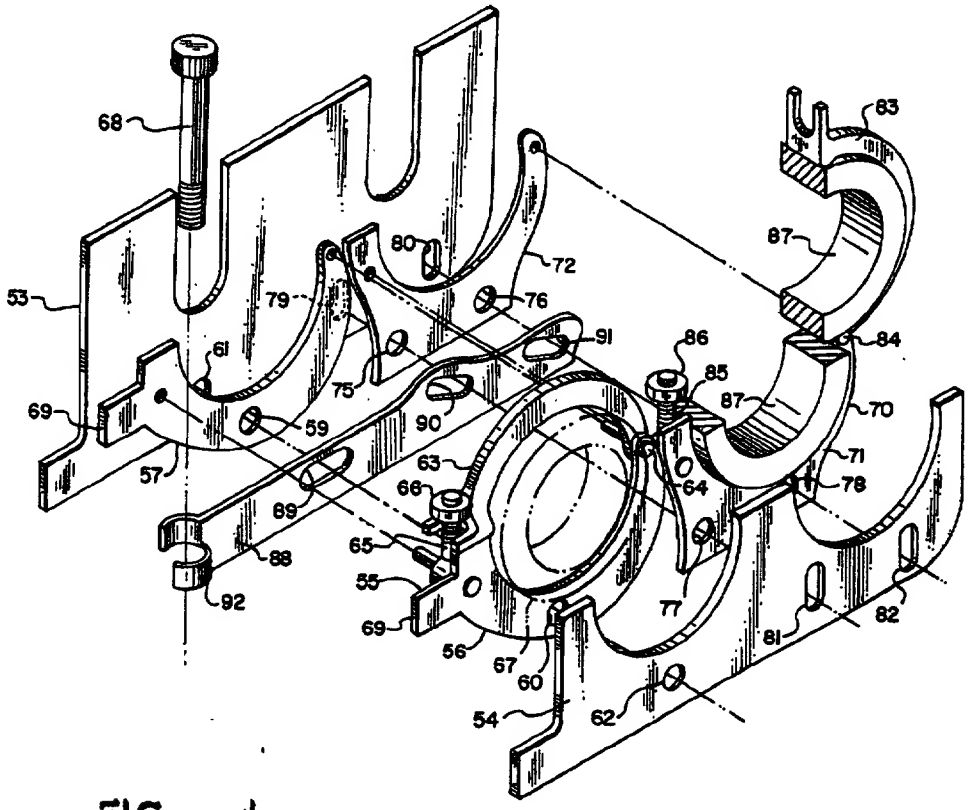
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FIG. 4

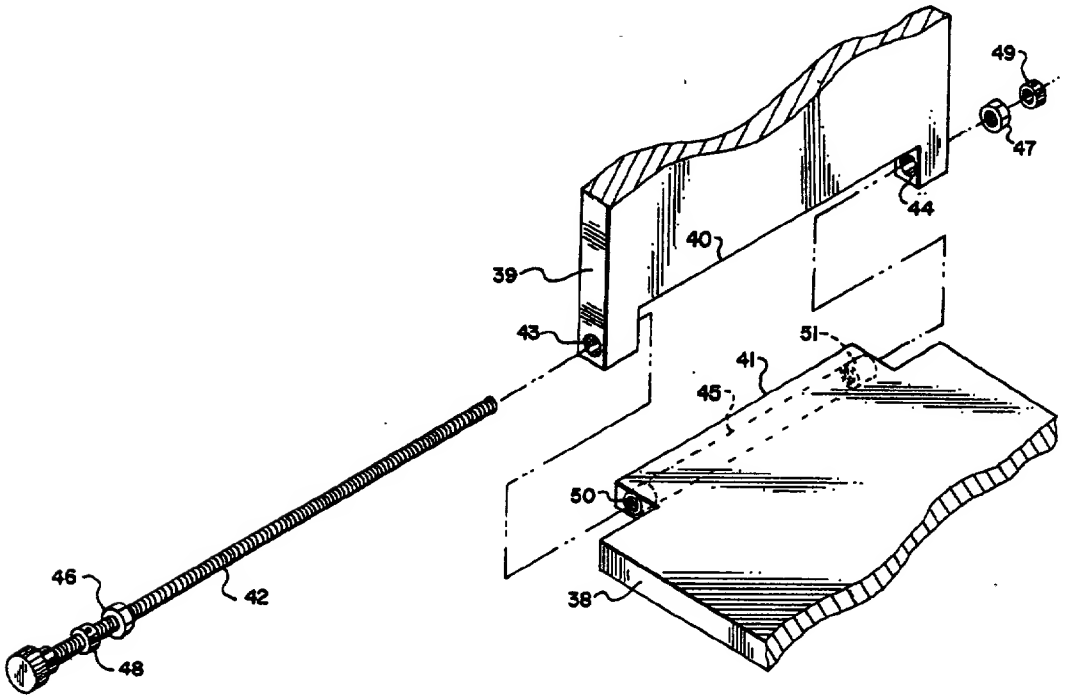
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FIG. 5

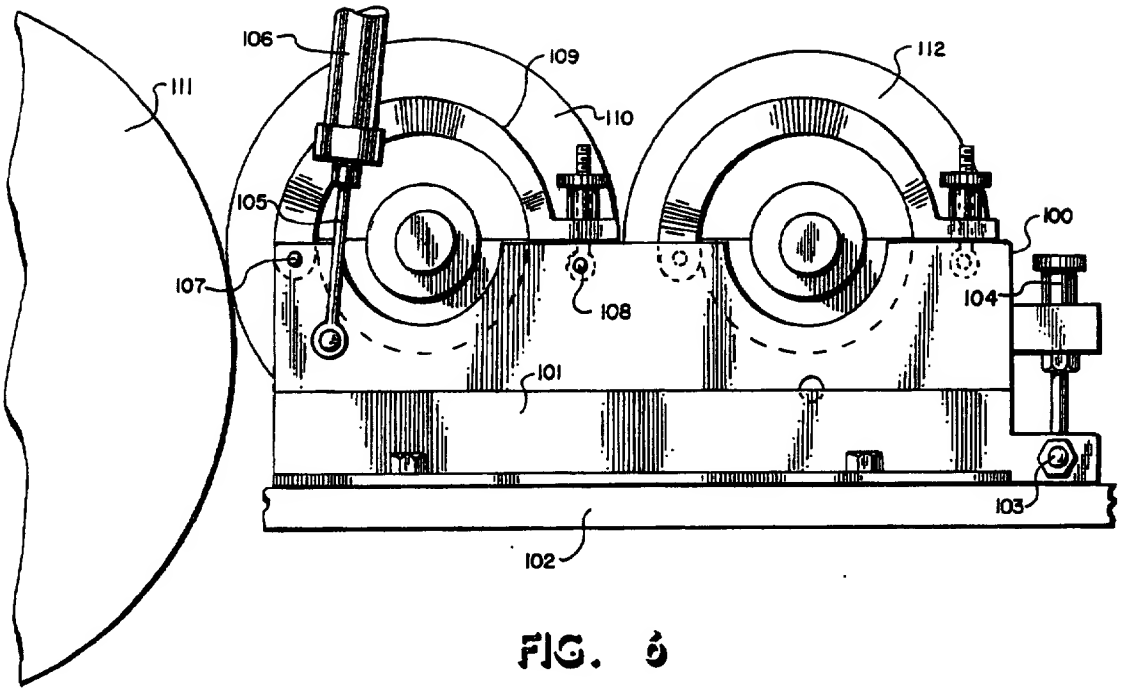
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FIG. 6

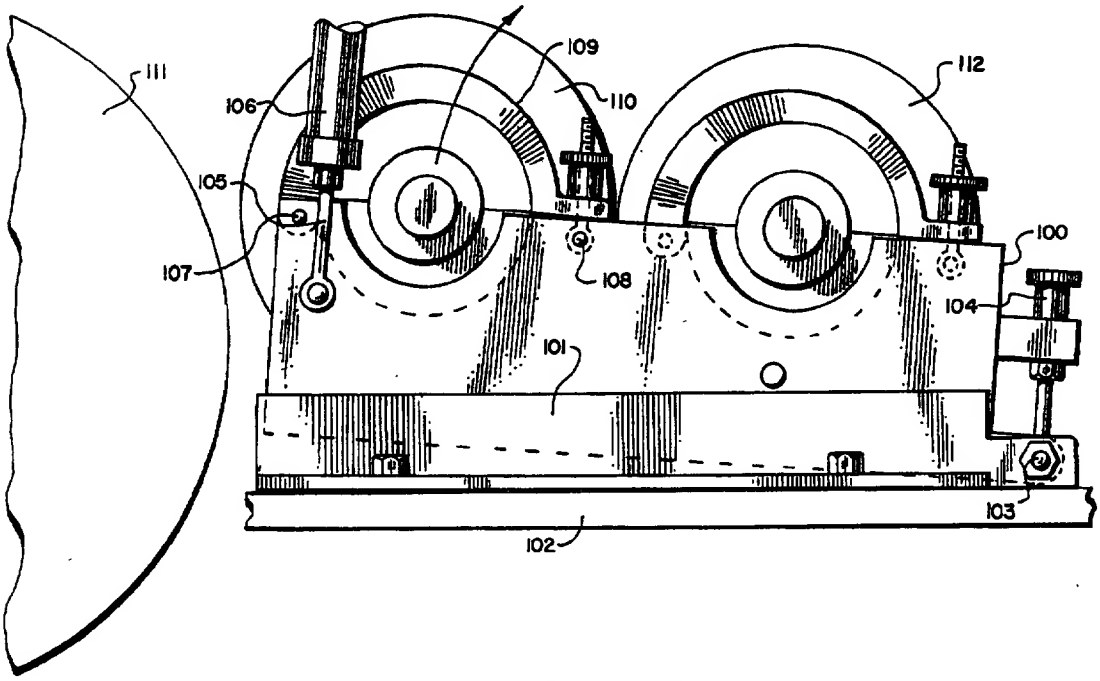
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FIG. 7

OFFSET LITHOGRAPHIC PRESS WITH INK METERING SYSTEM FOR BLANKET CYLINDER

BACKGROUND OF THE INVENTION

Offset lithographic printing is a method employing a plate cylinder which carries a planographic printing plate, whose image and non-image portions are substantially coplanar, the image area being hydrophobic and the non-image area being hydrophilic. A dampening system applies aqueous solution to the non-image areas of the plate, and an inking system applies a greasy ink to the image portions. The thus coated plate is rotated into contact with a resiliently surfaced blanket cylinder, thereby transferring the ink (and dampening solution) from the plate cylinder to the blanket cylinder. Printing stock, in either sheet or web form, is fed against the blanket cylinder by an impression cylinder, and the ink (and dampening solution) is transferred to the stock, thus completing the printing operation except for any heat-drying which may be employed.

Flexographic printing represents a different approach than offset printing, and its most common applications involve printing on web stock employed in packaging, such as corrugated stock, plastic, etc. Printing plates are employed in which the image areas are raised with respect to the non-image areas, rather than being co-planar with them. There is no blanket cylinder, and the plate cylinder comes into direct contact with the stock, which is delivered against it by an impression cylinder. Ink is applied to the image areas of the plate by rollers working in an ink pan adjacent the plate cylinder.

Each of these two methods of printing has its own set of advantages and disadvantages, but as the art has developed thus far, it has not been possible to operate both methods on a single press, using whichever is most advantageous for a given job. In the art of offset printing, techniques of sheet feeding are highly developed, while, as pointed out above, web feed is normative for flexographic presses, and the advantages of flexographic printing are largely foregone in sheet-fed applications.

In the field of offset printing, development work is being done on catalyst-set inks and other two-part ink systems. One difficulty with catalytic systems is the tendency of the catalyst to back-migrate from its point of application to the plate cylinder into the ink fountain, where it causes premature setting of the ink.

In some printing applications, it is desirable to coat the stock with a varnish or other coating after the printing has been applied, instead of printing on top of stock precoated by the paper manufacturer. For such applications, printing houses have a need for equipment capable of applying a suitable over-coating to printed stock. Preferably, such equipment should be capable of applying the coating simultaneously with the printing, but in any event, it should be capable of applying the coating in a separate step.

SUMMARY OF THE INVENTION

The present invention addresses the problems and needs just outlined. In accordance with the present invention, equipment is provided for mounting on an offset press for feeding ink, ink component, coating material, or another liquid directly to the blanket roll of the press The equipment of the invention includes an ink fountain, at least a pair of rolls mounted to work in the fountain to pick up ink therefrom, means for moving one of said rolls into and out of ink transferring contact with a blanket roll, driving means for the rolls, and means for mounting these parts on an offset press adjacent its blanket roll, and for adjusting and aligning their position with respect to the blanket roll. In its preferred form, the mounting means includes quick release collars enabling easy removal of the rolls of the invention from the press for cleaning and maintenance, and so they will be out of the way when the press is used in operations not involving their use.

As those with ordinary skill in the art know well, offset presses are and have been produced in many different sizes and configurations. The equipment of the invention is made up of standardized components which, in most instances, may be readily adapted to presses of many different configurations with little or no change in any given component.

The rolls employed in the invention may have surfaces of various kinds which are effective for picking up and transferring ink, and need not have identical surfaces. For example, one roll may be rubber coated, while the other may be etched metal. The drive system for the rolls is preferably through a motor independent of the motor driving the rolls of the press, and it is preferred that a variable speed control be provided so that the rolls of the invention may be driven at selected surface speeds with respect to the surface speed of the blanket roll. In this way an additional means of controlling the transfer of ink to the blanket roll is provided, since the relative surface speeds of the blanket and transfer rolls determine the degree of scrubbing action between the two, and the intensity of the scrubbing action influences the thickness of the ink film transferred.

The equipment of the invention, when associated with an otherwise conventional offset press, materially increases the versatility of the press, and makes possible practice of the several method aspects of the invention.

A conventional offset press, with the equipment of the invention mounted thereon, may be operated as a paper coater by placing a fully exposed photosensitive plate on the blanket roll, thereby effectively converting it to a plate cylinder positioned in the same relative position as the plate cylinder of a flexographic press, that is, working against the impression cylinder. The true plate cylinder is disengaged from the thus converted blanket roll, and may even be removed from the press if desired. (The disengagement or removal of the plate cylinder also effectively disengages the dampening and inking systems associated with that cylinder.)

The ink fountain of the equipment of the invention is then loaded with coating material, and the transfer roll is positioned to work against the blanket roll which has been converted to a plate cylinder, at a selected relative surface speed. The blanket roll is placed in rotation, and stock to be coated (in either sheet or web form, depending on the press) is fed against the rotating blanket roll by the impression cylinder. Coating material is thus fed from the fountain to the transfer roll, from that roll to the plate on the blanket roll, and then from that plate to the stock.

The equipment of the invention is especially well adapted for applying water base acrylic or polyurethane coating materials, which are safer and more desirable environmentally in the press room, and which make possible water clean-up, thus saving on petroleum based solvents.

The fully exposed photosensitive plate which was used to convert the blanket roll to a plate cylinder may be replaced by a flexographic plate having raised image areas, and the coating material in the fountain of the equipment of the invention replaced with a flexographic type ink. The offset press in this condition is thereby made capable of printing flexographically when circumstances make it desirable to use this printing technique, with a far smaller capital investment than would be necessary to obtain a separate flexographic press.

When it is desired to operate the press as a conventional offset press, the coating plate or flexographic plate on the blanket roll is removed, and the transfer roll is moved out of working engagement with the blanket roll. If desired the transfer roll and pick-up roll may be removed from the press entirely. The plate cylinder is brought back into engagement with the blanket roll, and the press is thereby placed in condition to operate in the conventional offset manner.

When it is desired to conduct offset printing utilizing a catalyst set ink, the press is set up in the conventional offset manner, but with the transfer roll of the equipment of the invention positioned to work against the blanket roll. The primary ink component is placed in the main ink fountain feeding ink to the plate cylinder. The catalyst bearing component is placed on the blanket roll by the transfer roll prior in time to the transfer of the primary ink component from the image areas of the plate cylinder to the blanket roll. The thus catalysed ink on the blanket roll is then transferred to the stock brought against the blanket roll by the impression cylinder.

Several important advantages are obtained in accordance with this aspect of the invention. The ink is catalysed on the blanket roll immediately prior to its transfer to the stock, instead of at some point up on the plate cylinder. This means that extremely quick setting inks may be employed, and the danger of the ink setting prematurely on the plate cylinder is substantially eliminated. Furthermore, since the catalyst component of the ink, and its point of application, are farther removed from the main ink fountain, the danger of significant back-migration of the catalyst component up into the main ink fountain is greatly reduced, if not completely eliminated.

Another advantage flowing from the use of catalyst-set ink is that the need for spraying anti-offset powder onto the freshly printed stock to prevent the sheets from sticking together is eliminated, thus improving the press room environment and making it safer.

When it is desired to coat stock simultaneously with the printing of it, the press is set up in conventional offset manner, except that coating material (and lithographic plate desensitizing material, such as phosphoric acid and gum arabic) is placed in the fountain of the equipment of the invention, and the transfer roll is positioned to work against the blanket roll. In accordance with this aspect of the invention, a layer of coating material is first placed on the blanket roll. Ink is then placed on top of it by the plate cylinder. When the blanket roll contacts the stock, the ink is transferred to the stock, with the coating material being transferred to the stock primarily on top of the ink, as well as over the non-image areas. In such operations careful attention must be given to balancing aqueous and oily materials both in the ink and varnish in accordance with good practice in the art.

From the foregoing it can also be seen that catalyst may be incorporated into the coating material, and a catalyst set ink employed in the simultaneous printing and coating operation.

From the foregoing, it can be seen that a major object of the present invention is to greatly increase the capabilities of offset presses by adding to them a relatively simple and inexpensive set of equipment.

In particular, it is an object of the invention to equip an offset press so that it may print in a flexographic mode when desired and yet be readily returnable to operation in the standard offset mode.

In addition, it is an object of the invention to equip an offset press so that is is capable of operation as a paper coater, coating over printing either simultaneously with the printing, or in a separate step.

Another object of the invention is to equip an offset press to better handle two part or catalyst set inks.

Still another object of the invention is to equip an offset press to simultaneously print with catalyst set ink and coat the stock over the printing.

In addition, it is an object of the invention to provide a set of equipment giving an offset press the above-described capabilities, which equipment is made up of standardized components readily adaptable to presses of many different sizes and configurations.

The manner in which the foregoing objects and purposes, together with other objects and purposes, are achieved can best be understood from a consideration of the detailed description which follows, together with the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a very diagrammatic side elevational view, with many standard structural parts omitted for the sake of clarity, of an offset press to which has been applied the equipment of the invention;

FIG. 2 is a fragmentary perspective view on an enlarged scale of one embodiment of the equipment of the invention, showing also a portion of an offset press on which it is mounted;

FIG. 3 is a sectional side elevational view of the mounting means for the metering roll and transfer roll employed in the embodiment of FIG. 2, the section being taken on line 3—3 of FIG. 2;

FIG. 4 is an exploded perspective view of a portion of the mounting means of FIG. 3;

FIG. 5 is an exploded perspective view of another portion of the mounting means of FIG. 3;

FIG. 6 is an end elevational view of another embodiment of mounting means for the metering and transfer rolls of the invention, showing the transfer roll in contact with an offset press blanket cylinder; and

FIG. 7 is an end elevational view similar to FIG. 6, showing the metering roll moved out of contact with the blanket cylinder.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Attention is first directed to FIG. 1, which shows a conventional offset press in very diagrammatic form. The primary components of the press which are of present interest are the plate cylinder 10, blanket cylinder 11, and impression cylinder 12. Mounted adjacent the plate cylinder is a dampening system 13, including a dampening fountain 14, a metering roll 15, and a dampening roll 16. Also mounted adjacent the plate cylinder is an inking system 17, including a paste ink fountain 18

and a set of metering and transfer rolls 19. Various systems of metering and transfer rolls are in common use, and the roll set 19 in FIG. 1 is intended to be merely illustrative. A supply of printing stock 20 (shown as stacked sheets, but it may be a roll of web stock) is positioned to be fed, by conventional feeding means not shown in FIG. 1 to the impression cylinder 12.

The press as just described is conventional. In its conventional operation, a planographic plate is mounted in plate cylinder 10, which rotates clockwise as FIG. 1 is drawn. Aqueous dampening solution is applied to the hydrophilic non-image portions of the plate by the dampening system 13 as the plate is rotated past dampening roll 16. Greasy ink from fountain 18 is applied to the hydrophilic image portions of the plate by metering and transfer roll set 19. As the inked and dampened portion of the plate is further rotated, it comes into contact with the resilient surface of the blanket roll 11, which rotates counter-clockwise as FIG. 1 is drawn. The ink and dampening solution are transferred by this contact to the surface of the blanket roll.

Printing stock is fed from supply 20 onto clockwise rotating impression cylinder 12, which carries it through the nip between blanket cylinder 11 and impression cylinder 12. As the stock passes through this nip, the ink and dampening solution are transferred from the blanket cylinder to the stock, which is led away from the press by a take-off roll 21.

Conventionally, means are provided on an offset press such as that shown in FIG. 1 for moving the plate cylinder out of contact with the blanket cylinder for set-up, cleanup and maintenance purposes, and provision is also made for removing various rolls and cylinders from the press.

In FIG. 1, the equipment of the invention is shown as applied to the conventional offset press just described. It is designated generally as 30, and the components thereof appearing diagrammatically in FIG. 1 are ink fountain pan 31, metering roll 32, transfer roll 33, variable speed drive motor 34, and drive train 35. Drive motor 34 is preferably provided with a speed control so that the relative surface speeds of transfer roll 33 and blanket roll 11 may be established at desired values. A single metering roll 32 is shown in FIG. 1, but those skilled in the art will understand that multiple roll metering systems may be employed without departing from the scope of the invention.

The equipment of the invention 30 is shown in FIG. 1 as mounted on the offset press so that transfer roll 33 is in contact with blanket cylinder 11, and metering roll 32 is disposed in fountain 31 and in contact with transfer roll 33. The mounting means by which this is accomplished are not shown in FIG. 1 for the sake of simplicity, but are shown in full detail in FIGS. 2 through 5, to which attention is now directed.

In the case of a number of widely used offset presses the frame or other stationary portion of the press includes a substantial horizontal surface running the length of the blanket cylinder. This surface is designated 36 in FIG. 2, and it is exploited as a mounting surface in the practice of the invention. If no such surface exists on a particular press to which the invention is to be applied, a shelf may be added to the press frame to provide one, the geometry of the shelf depending on the geometry of the press frame. Similarly, on many presses, the frame includes a pair of convenient vertical surfaces located above surface 36 at either end of the blanket roll, one of which appears in FIG. 2 where it is designated 37. These, too, are exploited as mounting surfaces in the practice of the invention. Again, if such surfaces are absent from a particular press, they may be added.

The mounting means of the invention includes main mounting plate 38, which slidingly rests on surface 36, and two side mounting plates 39, one attached at either end of plate 38 to press frame surface 37. As can best be seen in FIG. 5, plate 39 has a cut-out 40 in the bottom thereof, while the end of plate 38 has a tongue 41 formed on it. Tongue 41 is narrower than cut-out 40, so that when tongues 41 are fitted into cut-outs 40 at each side of the press, there is room for mounting plate 38 to be slid on surface 36 toward and away from the blanket roll.

In accordance with the invention, control of the position of mounting plate 38 (and of the equipment mounted on it) with respect to the blanket cylinder is provided by adjusting screw 42 which runs in clearance holes 43 and 44 in plate 39 and clearance hole 45 in tongue 41. Adjusting screw 42 is secured to plate 39 by set nuts 46 and 47, and locked against rotation when adjustment is completed by lock collars 48 and 49. Clearance hole 45 in tongue 41 has threaded inserts 50, 51, mounted in either end thereof, and screw 42 is threaded through them. Thus, when adjusting screw 42 is rotated it will push plate 38 toward the blanket cylinder or pull it away from the cylinder, depending upon the direction of rotation of the screw. By turning and then locking the adjusting screws at either end of plate 38, the plate may be brought to the desired position with respect to the blanket roll and held there.

As appears best in FIG. 2, ink fountain 31 is positioned on main mounting plate 38, as are the roll mounting means designated generally as 52.

The structure of roll mounting means 52 may best be understood by a consideration of FIGS. 2-4. In the embodiment shown in those Figures, the roll mounting means comprise a pair of vertically oriented base plates 53, 54 which are positioned parallel to each other on mounting plate 38, one pair being positioned at each end of fountain pan 31. Mounted between the base plates and carried by them are two collars which support the shafts of metering roll 32 and transfer roll 33, these shafts being designated 32*a* and 33*a*, respectively.

Metering roll collar 55 is made up of a pair of bottom yokes 56, 57 which are pivotally mounted on the vertical bases 53, 54 by pin 58, which passes through holes 59, 60 in the bottom yokes and is fixed in holes 61, 62 of vertical base plates 53, 54. The metering roll collar also includes a top yoke 63, one side of which is pivotally attached to the bottom yokes by pin 64, and the other side of which is detachably connected to the bottom yokes by swing bolt 65 and nut 66. Mounted in the yokes of the metering roll collar is a split bushing 67, which engages the housing of anti-friction bearing 67*a* carried on shaft 32*a*. From the foregoing, it can be seen that metering roll 32 can easily be removed from collar 55 by merely loosening nut 66, and swinging top yoke 63 to open the collar. Remounting roll 32 is similarly easily accomplished.

Metering yoke collar 55 and metering roll 32 may be pivoted toward and away from transfer roll 33, the pivoting taking place around 58. The degree of pivoting is controlled by bolt 68, which works in a threaded hole in main mounting plate 38, and which engages wings 69 on bottom yokes 56, 57. In this manner provision is

made for controlling the pressure with which the metering roll and transfer roll contact each other, and this pressure in turn is one means of controlling the rate at which liquid is fed from the fountain pan to the blanket roll.

Transfer roll collar **70** is also made up of a pair of bottom yokes **71, 72,** which are slidingly mounted on vertical base plates **53, 54** by pins **73, 74** which pass through holes **75, 76, 77, 78** in the bottom yoke and work in slots **79, 80, 81, 82** in vertical base plates **53, 54.** The transfer roll collar further includes a top yoke **83,** which is pivoted to the bottom yokes on one side by pin **84,** and detachably connected to them on the other side by swing bolt **85** and nut **86.** Within the yokes is mounted a split bushing **87,** which in turn engages anti-friction bearing **87***a* carried on shaft **33***a.* This arrangement facilitates installation and removal of transfer roll **33.**

An actuating bar **88** is provided for moving transfer roll collar **70,** and transfer roll **33** into and out of contact with the blanket roll. In the embodiment of FIGS. **2–5,** the direction of this movement is substantially vertical, but in other embodiments designed to fit a particular press it may be at an angle or even horizontal. Actuating bar **88** has a slot **89** therein to clear pin **58** and cam slots **90, 91,** therein positioned to work against pins **73, 74** of the transfer collar to lift the transfer roll when the actuating bar is moved to the right as FIGS. **3** and **4** are drawn. The end of bar **88** is curved as at **92** to avoid interference with bolt **68.** A solenoid or air-operated piston and cylinder **93** (see FIG. **2**) is provided for power operation of the actuating bar.

From the foregoing discussion of the mounting means of the invention as shown in the embodiment of FIGS. **2–5,** it can be seen that the following capabilities are provided: (1) the position of the transfer roll with respect to the blanket roll may be adjusted without altering its position with respect to the metering roll and ink fountain, since these parts move with it on the movable main mounting plate; (2) the contact pressure between the metering roll and the transfer roll can be adjusted by pivoting the metering roll; (3) the transfer roll can be moved into and out of contact with the blanket roll; and (4) both the metering roll and the transfer roll can be easily removed for cleanup and maintenance, or merely to get them out of the way when they are not needed.

Referring again to FIG. **2,** it can there be seen that roll shafts **32***a* and **33***a* have drive gears **94, 95** mounted thereon adjacent their ends. Alternately, these gears may be mounted inboard of bearings **67***a* and **87***a,* but they have been shown as drawn in FIG. **2** for clarity in presentation. Gears **94,** and **95** are driven by other gears of the drive train (represented diagrammatically at **35** in FIG. **1**) and ultimately by drive motor **34** (FIG. **1**).

An additional means for exercising control over the flow rate of liquid between the fountain pan and the transfer roll is provided by metering bar **96,** which is adjustably mounted on the ink fountain by mounting bracket **97** so that it lies closely adjacent the surface of metering roll **32.** In this way the thickness of the layer of liquid carried on the surface of the metering roll to the nip between it and the transfer roll may be controlled by adjusting the spacing between the bar and the roll.

Attention is now directed to FIGS. **6** and **7,** which show an alternate embodiment of the roll mounting means of the invention, which is especially useful on those presses whose structure is such that it is more convenient to move the transfer roll into and out of contact with the blanket cylinder by an actuator which is generally vertically mounted rather than by a horizontal actuator such as that employed in the embodiment of FIGS. **2–5.** Many of the parts are similar or substantially the same as those discussed in connection with that embodiment, and reference is made to the above discussion for a detailed understanding of those parts.

In the embodiment of FIGS. **6** and **7,** the vertical base plates **100** are pivotally mounted between a pair of vertical support plates **101,** which are in turn bolted to main support plate **102.** The pivot point is at bolt **103,** which also serves to anchor metering roll adjusting screw **104** by passing through an eye formed in the end thereof.

The horizontal actuating bar **88** of the FIGS. **2–5** embodiment is omitted, and is replaced by actuating rod **105,** which may be the piston rod of air-operated piston and cylinder unit **106.** Pins **107, 108,** connect transfer roll collar **109** to vertical base plates **100** so that when actuating rod **105** pivots plates **100** about bolt **103,** the collar **109,** as well as transfer roll **110,** is pivoted toward or away from blanket cylinder **111,** while maintaining its position with respect to the adjusted position of metering roll **112.**

With the foregoing description of the equipment of the invention in hand, its mode of operation, and the mode of operation of an offset press equipped with it, can be described with primary reference to FIG. **1.**

The equipment of the invention **30** is first positioned so that the transfer roll **33** establishes satisfactory contact with the blanket cylinder **11** (when it is actuated into its contact position) by adjusting the portion of the mounting means illustrated in FIG. **5,** and the metering roll pressure against the transfer roll is adjusted to a satisfactory level by pivoting its mounting collar.

As FIG. **1** is drawn, the thickness of the printing stock and the thickness of the layer of ink or coating material on rolls **32** and **33** and blanket cylinder **34** are both greatly exaggerated for clarity of illustration.

FIG. **1,** as drawn, shows the press and the equipment of the invention set up and operating as a paper coater. Plate cylinder **10,** including its dampener **13** and inking system **17,** is spaced out of contact with blanket cylinder **11,** and is inactive in this mode of operation. A fully exposed photosensitive plate is mounted on the blanket cylinder. Coating material (varnish) is placed in fountain **31.** As motor **34** drives metering roll **32** and transfer roll **33,** a layer of coating material is picked up from the fountain and transferred to the plate on the rotating blanket cylinder. As the rotating blanket cylinder engages sheets of paper stock (or a web of stock) presented to it by impression cylinder **12,** the layer of coating material it carries is transferred to the stock, thus coating it.

If the above mentioned photosensitive plate is removed from blanket cylinder **11** and is replaced with a flexographic printing plate and if the coating material in fountain **31** is replaced by flexographic type ink, then FIG. **1,** as drawn, represents the equipment of the invention operating to enable the offset press to print flexographically. Flexographic ink is transferred by rolls **32** and **33** to the image areas of the flexographic plate on blanket cylinder **11,** and thence to the stock.

If the offset press is again needed for conventional offset printing, transfer roll **33** is disengaged from the blanket cylinder, and if desired, it and metering roll **32** may be completely removed from the press. The plate is

removed from the blanket cylinder, and the plate cylinder is returned to engagement with the blanket cylinder, thus restoring the press to conventional offset configuration.

With the press in offset configuration, and with transfer roll **33** engaging the blanket roll, catalyst-set ink printing may be performed, with the catalyst component being placed in fountain **31**. Similarly, simultaneous printing and coating, including printing with catalyst set ink may be performed.

I claim:

1. Apparatus for attachment to an offset lithographic press of the kind having a plate cylinder, a blanket cylinder, and an impression cylinder, said apparatus comprising:

an ink fountain

an ink transfer roll;

an ink metering system positioned to transfer ink from said fountain to said transfer roll, said metering system including at least one metering roll;

mounting means for mounting said fountain, transfer roll and metering system on said press adjacent its blanket cylinder, said mounting means including means for adjusting the position of said transfer roll with respect to said blanket cylinder said mounting means comprising;

a main mounting plate slidingly mounted on a substantially horizontal surface of said press adjacent said blanket cylinder;

adjusting screw mounting means attached to said press adjacent each end of said main mounting plate;

an adjusting screw confined against endwise movement in its mounting means but free to rotate therein;

threaded means on said main mounting plate threadedly engaging said adjusting screw, whereby rotation of said adjusting screw slides said main mounting plate toward and away from said blanket cylinder;

said fountain being mounted on said main mounting plate; and

said mounting means further comprising:

(i) vertical base plates mounted on said main mounting plate adjacent each end of said fountain; and

(ii) collars mounted on said vertical plates and engaging said metering roll and said transfer roll to support them above said fountain, the upper portion of said collars being pivotable with respect to the lower portions thereof to thereby provide for rapid removal and installation of said rolls out of and into said collars;

means for adjusting the pressure between said metering roll and said transfer roll;

means for moving said transfer roll into and out of contact with said blanket cylinder including means mounting said collars engaging said transfer roll on said vertical base plates for movement with respect to said vertical base plates toward and away from said blanket cylinder; and

a variable speed motor for said metering roll and said transfer roll.

2. Apparatus in accordance with claim **1** in which

said adjusting screw mounting means comprise a side mounting plate mounted on said press adjacent an end of said main mounting plate, said side mounting plate having a cut-out in the bottom thereof, and in which

said main mounting plate has a tongue at an end thereof narrower than said cut-out and projecting thereinto, and in which

said adjusting screw passes through said side mounting plate and said tongue.

3. Apparatus in accordance with claim **1** and further comprising mounting means for each of said collars engaging said transfer roll each of said collar mounting means comprising:

a guide slot on one of said vertical base plates;

an actuating bar positioned parallel to said one vertical base plate;

a cam slot in said actuating bar; and

a pin in each of said collars passing through said guide slot and said cam slot, to thereby provide for said movement of said collars toward and away from said blanket cylinder upon reciprocal movement of said actuating bar along said vertical base plate.

4. Apparatus in accordance with claim **1** in which said mounting means for said collars engaging said transfer roll comprises:

pivot means on said vertical base plates mounting both said transfer roll engaging collars and the collars for said metering roll for pivoting movement with respect to said blanket cylinder; and

an actuating rod for effecting said pivotal movement.

* * * * *

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United States Patent [19]

Jahn

[11] **Patent Number: 4,706,601**

[45] **Date of Patent: Nov. 17, 1987**

[54] **DEVICE FOR APPLYING MEDIUM AFTER TERMINATION OF THE PRINTING OPERATION IN A PRINTING MACHINE**

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[21] Appl. No.: **735,954**

[22] Filed: **May 20, 1985**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 626,732, Jul. 2, 1984, abandoned.

[30] **Foreign Application Priority Data**

Jul. 5, 1983 [DE] Fed. Rep. of Germany 3324096

[51] **Int. Cl.**[4] **B05C 1/02; B05C 11/10**

[52] **U.S. Cl.** **118/46**; 118/211; 118/236; 118/249; 118/262

[58] **Field of Search** 118/46, 236, 249, 104, 118/203, 211, 247, 262

[56] **References Cited**

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Primary Examiner—Evan K. Lawrence

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[57] **ABSTRACT**

In a printing machine, a medium applicator disposed downstream of printing units of the machine, in travel direction of a sheet which has been printed, the applicator having three rollers including a first roller for taking up medium from a supply container, a second roller for metering a quantity of the medium to be applied, and a third roller having the same diameter as that of cylinders of the printing units for transferring the medium, includes a rubber lining disposed on the third roller for directly applying the medium onto the printed sheet; the three rollers, during application of the medium, being in constant meshing engagement with a sheet-transferring cylinder; a device for uncoupling the three rollers from the sheet-transferring cylinder, and a separate motor for driving the three rollers when the rollers are uncoupled.

6 Claims, 6 Drawing Figures

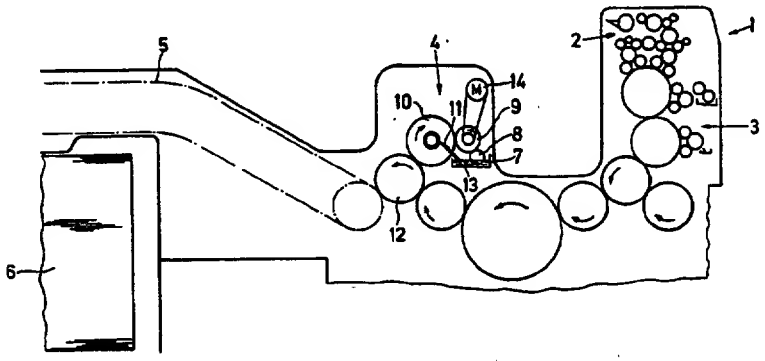


Fig. 1

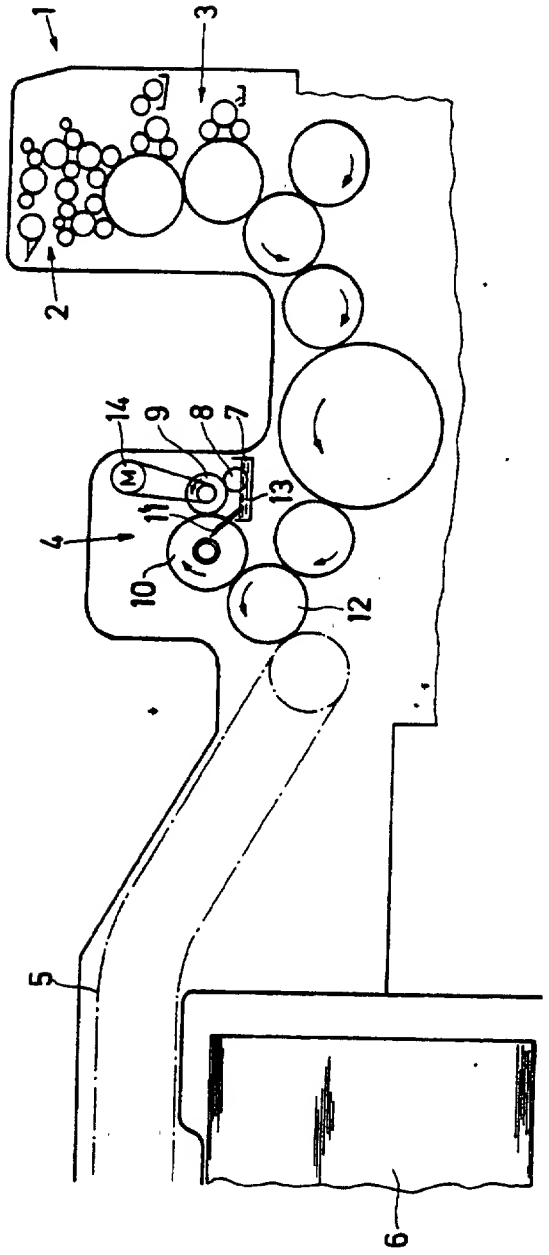
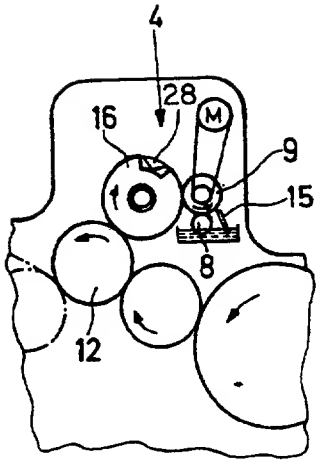


Fig. 2



Document: US 4706601 A

Fig. 3

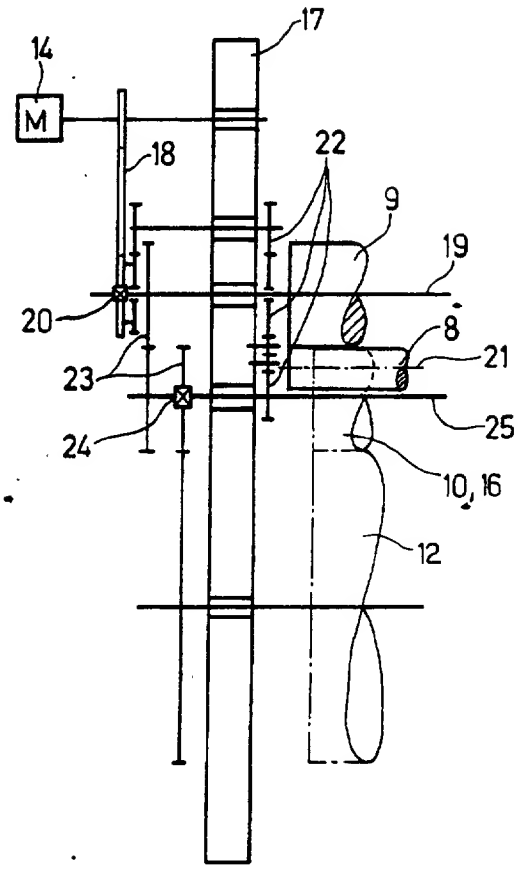


Fig. 4

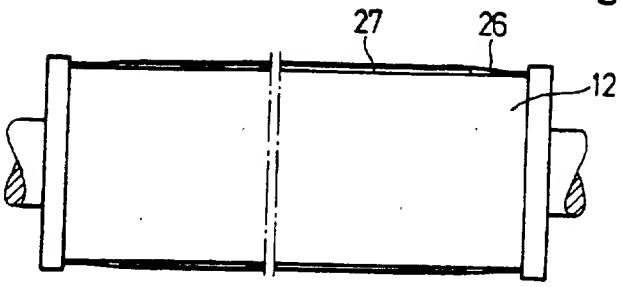


Fig. 5

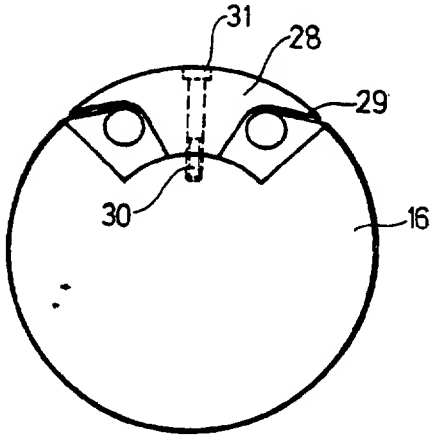
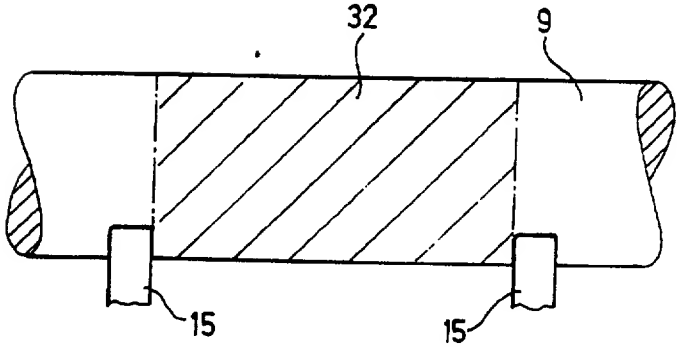


Fig. 6



DEVICE FOR APPLYING MEDIUM AFTER TERMINATION OF THE PRINTING OPERATION IN A PRINTING MACHINE

This is a continuation-in-part application of Ser. No. 626,732, filed July 2, 1984, and now abandoned.

The invention relates to a device in printing machines for applying a medium, such as lacquer, especially, by means of three rollers, after the printing process has been terminated, the rollers including a first roller for taking up medium from a supply container, a second roller for metering a quantity of the medium to be applied and a third roller having the same diameter as that of cylinders of the printing units for transferring the medium to a printed sheet.

A lacquering or varnishing device in printing machines has become known theretofore from German Published Non-Prosecuted Application No. (DE-OS) 30 46 257. This device includes a lacquer storage tank or supply container and a scooping roller dipping into this tank. The lacquer taken up by the scooping roller is fed in metered fashion to an applicator roller. Two ductor rollers, by means of which a format-related lacquer feed occurs, can be set close to the scooping roller. A ductor blade applicable against the metering roller is also provided. This ductor blade serves to wipe superfluous lacquer from the metering roller and to return it to the supply container.

A specific disadvantage of this heretofore known device is that the lacquer is fed to the varnishing or lacquering cylinder via a distributor roller and an applicator roller. Because of the relatively long transport distance which the lacquer has to cover over many rollers until it reaches the printed sheet, the lacquer begins to set i.e. no quick-drying lacquers can be used. Due to this limitation to slowly drying lacquers, when the sheet is delivered the reverse side or back of the next following sheet will smear the lacquer and thus paste the sheets together. Consequently, no full sheet piles can be set up, because the pile weight which is built up at the delivery end and which applies a load to the individual sheets also limits the lacquer layer thickness.

In the device described in German Pat. No. 23 45 183 for applying a medium there are provided a dipping roller, a metering roller, an applicator roller, a back-pressure cylinder, a form cylinder and another applicator roller. The two applicator rollers, the dipping roller and the metering roller are combined into a common structural unit. Within this structural unit, either the dipping roller with the form cylinder or the first applicator roller with the form cylinder or the second applicator roller with the back-pressure cylinder can cooperate.

A disadvantage of this last-mentioned construction is that the lacquer must first be fed to the printed material via the form cylinder. The platen mounted on the clamping device at the form cylinder forms a channel in which the lacquer accumulates after a given operating time. This lacquer-accumulation results in an irregular lacquer application due to dripping of the lacquer down onto the printed material.

German Pat. No. 20 20 584 is based upon a device for avoiding smearing of the ink due to lacquering. By means of a lacquering unit, the lacquer is applied to a printing- unit cylinder. This printing-unit cylinder, which has the same diameter as that of the cylinders of the preceding printing units, transfers the lacquer to the

printed material. The disadvantages referred to hereinbefore are also applicable to this construction and require additionally, time-consuming cleaning work to be performed on the rollers. Moreover, the construction of the printing unit is complicated by having to attach the lacquering unit to the rubber of the blanket cylinder.

A further disadvantage of the state of art as exemplified by the references cited hereinbefore, is that, due to the directions of rotation of the rollers, the format-related wiping by the ductor blade cannot be observed, thus making impossible a precise wiping or removal of the superfluous lacquer material.

It is, accordingly, an object of the invention to provide a device for applying a medium such as lacquering unit in a printing machine, wherein the medium, such as lacquer, has to travel over the shortest possible distance from the storage tank or supply container to the printed material, and wherein drying of the lacquer on the rollers is prevented, when the lacquering unit is connectible and disconnectible, as required.

With the foregoing and other objects in view, there is provided, in accordance with the invention, in a printing machine, a medium applicator disposed downstream of printing units of the machine in the travel direction of a sheet which has been printed, the applicator having three rollers including a first roller for taking up medium from a supply container, a second roller for metering a quantity of the medium to be applied, and a third roller having the same diameter as that of cylinders of the printing units for transferring the medium comprising a rubber lining disposed on the third roller for directly applying the medium onto the printed sheet; the three rollers, during application of the medium being in constant meshing engagement with a sheet-transferring cylinder; means for uncoupling the three rollers from the sheet-transferring cylinder, and separate motor means for driving the three rollers when the rollers are uncoupled.

In accordance with another feature of the invention, the third roller is in the form of a cylinder with a continuous surface.

Due to the fact that the cylinder surface of the applicator roller is not broken by a channel, the lacquer can be applied uniformly. Thus, the burdensome cleaning operations can be dispensed with. Because of the limitation to this relatively small number of rollers, it is possible, for example, to apply the lacquer directly to the sheet after the last ink impression i.e. to bring it on-line. When, for example, printed cardboard, which is to be converted afterwards into packaging material, is provided with such a lacquer layer, then this packaging material receives increased portection thereby which is of advantage during the subsequent transport operation. Moreover, the gloss provided by the lacquer enhances the effect of the impression. The cardboard or pastboard treated in this way is also better protected against environmental influence.

Because the rollers, during the application of the medium are in constant meshing contact with the cylinder, assurance is provided that the subsequent or further treatment of the surfaces of the printed material occurs at the speed of the printing machine.

Disengagement of the lacquering device from the cylinder provides the possibility of excluding a given portion of the impression from any subsequent treatment. The motor provided for driving the rollers of the applicator of lacquering prevents drying of the medium

on the rollers. Thus, the burdensome cleaning activities can be dispensed with for the next operating cycle.

In accordance with a further feature of the invention, the rubber lining on the third roller is a rubber cloth applied in an abuttting manner, the third roller having the same diameter as that of the sheet-transferring cylinder; and the third roller being connected by a single-revolution clutch to the sheet-transferring cylinder.

It is thereby possible to use any type of cylinders, because, in this form of application of the rubber cloth or blanket also, no channel is formed in which the lacquer might otherwise accumulate. The third roller has the same diameter as a printing-unit cylinder.

In accordance with an added feature of the invention, there is provided a ductor blade disposed on at least one of the end faces of the third roller serving to transfer the medium to the printed sheet, the ductor blade being disposed so that when superfluous medium is removed by the ductor blade, the thus removed superfluous medum can flow back into the supply container. Thus, an economical use of the medium, in the further treatment is afforded thereby, and contamination of the printing machine is prevented.

In accordance with an additional feature of the invention, the third roller is in the form of a cylinder having a channel formed therein; and including an insert member received in channel so as to complete a continuous cylinder. By inserting a filling piece or insert member into this channel, which can be covered by a rubber cloth or blanket, the benefits of a full or solid cylinder can also be attained.

When such cylinders are used, in accordance with a concomitant feature of the invention, a ductor blade is disposed on the second roller. Thus, precise metering of the medium or lacquer occurs in conformity with the sheet format. A particularly advantageous metering process is also ensured due to the directions of rotation of the rollers, because, in this arrangement, the application of the lacquer is always effected from above.

Other features which are considered as characteristic for the invention are set forth in the appended claims.

Although the invention is illustrated and described herein as embodied in a device for applying medium after termination of the printing operation in a printing machine, it is nevertheless not intended to be limited to the details shown, since various modifications and structural changes may be made therien without departing from the spirit of the invention and within the scope and range of equivalents of the claims.

The construction and method of operation of the invention, however, together with additional objects and advantages thereof will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

FIG. 1 is a diagrammatic elevational view of a printing machine with lacquering unit and a ductor blade assembly arranged at an applicator roller and disposed in front of the delivery unit; and

FIG. 2 is a fragmentary view of FIG. 1 showing the printing machine with lacquering unit and with a ductor blade arranged at a metering roller.

FIG. 3 is a diagrammatic side elevational view of the gearing and uncoupling mechanism for the rollers of the lacquering unit;

FIG. 4 is a diagrammatic axial view of a sheet transferring cylinder of the lacquering unit equipped with a format-related underlay;

FIG. 5 is an end view of one of the rollers of the laquering unit which is formed with a longitudinal channel wherein an insert member is received; and

FIG. 6 is a diagrammatic longitudinal view of the metering roller of the lacquering unit and showing ductor blades disposed thereon.

Referring now to the drawing and first, particularly, to FIG. 1 thereof, there is shown a printing machine with a final last printing unit 1 equipped with a conventional inking unit 2 and a conventional dampening unit 3. This last printing unit 1 is followed by a lacquering unit 4. The printed sheets are fed by the last printing unit 1 to the lacquering unit 4. Subsequent to a final treatment of the sheets by the lacquering unit 4, the sheets are seized by a delivery chain 5 and thus transported to a delivery pile 6.

The lacquering unit 4 which is arranged downstream of or behind the last printing unit 1 in travel direction of the sheets is formed of a dipping roller 8 revolving within a supply container or tank 7, a metering roller 9 and an applicator roller 10 provided with a rubber lining or covering (not shown). At an end face of this applicator roller 10, there is additionally a ductor blade 11. The specific character of the applicator roller 10, which has the same diameter as that of a sheet transferring cylinder 12, is maintained both when it is covered with a separate rubber cloth or blanket and the channel formed therein covered by an insert member or a filling or loading piece, or, alternatively, when a rubber cloth of blanket is applied so that the leading and trailing edges thereof abut. Consequently, it is also possible to limit the applicaton of the lacquer to specific areas. The applicator roller 10 is in direct contact with the cylinder 12 which is provided with an elevator mechanism adapted to the sheet format and on which the printed sheet which is to be further processed is located. This cylinder 12 is equipped with non-illustrated grippers disposed in recesses i.e. the gripper back is at a deeper level than the surface of the sheet which is to be further processed. After the further processing has been completed, the cylinder 12 transfers the sheet to the conveyor or delivery chain 5 of the delivery unit which conveys the sheet to the deliver pile 6.

The storage tank or supply container 7 contains a medium or agent 13 to be used for the further treatment or processing of the printed sheets. This medium may be either a lacquer or a rubber cement or any other agent suited for this purpose. During the rotating movement of the dipping roller 8, the medium 13 is taken up thereby and subsequently transferred to the metering roller 9. The applicator roller 10 which is in direct contact with the metering roller 9 transfers the medium 13 to the surface of the printed sheet which is to be treated.

Because it is hardly possible to prevent the medium 13 from running down over the ends of the applicator roller 10, ductor blades 11 are disposed thereat. The medium 13 running down the ends of the applicator roller 10 is wiped off by the ductor blade 11 and flows back to the storage tank or supply container 7 for reuse. In this way, contamination of the printing machine is prevented and, at the same time, economical use of the medium 13 is enhanced.

The applicator roller 10 is controllable via an impression throw-off which is applied in such a manner that only the applicator roller 10 can be engageable with and retracted from the cylinder 12. Hence, the dipping roller 8, the metering roller 9 and the applicator roller 10

are always in mutual contact. During the application of the medium 13, the rollers 8, 9 and 10 of the lacquering unit 4 are driven via the drive mechanism of the printing machine. The further treatment or processing of the sheets thus occurs, at the operating and printing speed, respectively, of the machine.

When this further or subsequent treatment of the sheets is, for example, not required for a specific portion of the total impression or when the printing machine is stopped for a time, then the lacquering appliance 4 is disengaged from the cylinder 12. In order to prevent the medium 13 from drying on the rollers 8, 9 and 10 during this period of time, a motor 14 which is coupled to the metering roller 9 takes up the driving function and, thus, indirectly also the driving of the dripping roller 8 and of the applicator roller 10 which are in direct contact with the metering roller 9. In this regard the rollers 8, 9 and 10 need not rotate at fully machine speed. Only a few rotations per minute are thus required in order to prevent the drying of the medium 13.

A single-revolution coupling or clutch 24 (FIG. 3), for example, effects the disengagement or decoupling of the lacquering unit 4 from the cyliner 12 when the specific embodiment is one wherein the rubber cloth or blanket has been applied in an abutting manner on the applicator roller.

Another embodiment of the lacquering unit 4 is illustrated in FIG. 2. The dipping roller 8 revolves in the storage tank or supply container 7 filed up with the medium 13, takes up the medium and transfers it to the metering roller 9. A ductor blade 15 is disposed on this metering roller 9 for effecting metered transfer of the medium 13. This metering feature operating in correspondence with a particular format permits the use also of a cylinder 16 interrupted or broken by a channel as an applicator roller. This cylinder 16 is also in direct contact with the sheet-carrying cylinder 12. For effecting disengagement, a single-revolution clutch or coupling 24 (FIG. 3) is used in order that, when the lacquering unit is restarted, the cylinder 16 does not touch down on the sheet at the very place where the channel is located. The drive of the lacquering unit 4 is effected in the same manner as for that of the lacquering unit 4 illustrated in FIG. 1.

The embodiments of this lacquering unit 4 permit the use thereof at all times as another printing unit. Because the applicator roller 10 or the cyliner 16 are rollers covered with a rubber lining or blanket, the possibility is afforded of having an additional impression cylinder and inking unit available, without great expense.

The uncouplability of the three rollers is represented in FIG. 3. The motor 14 is mounted in the side wall 17 located at the drive side of the printing machine, and drives a shaft 19 of the metering roller 9 via a belt 18 and a free-wheeling coupling 20. A shaft 21 of the dipping roller 8 is connected to the shaft 19 via gears 22. Likewise, a shaft 25 of the applicator roller 10 and of the cylinder 16, respectively, is coupled with the shaft 19 of the metering roller 9 via gears 23 and the single-revolution coupling or clutch 24.

The format-related underlay is shown in FIG. 4. Before a rubber blanket 26 is tightened on and around the cylinder 12, a previously calibrated sheet 27 accurately cut to the format being used is laid under. Assurance is thereby afforded that the application of lacquer will occur only in this region.

In FIG. 5, an insert member or filling or loading piece 28 is shown received in a channel 29 formed in the cylinder 16. The insert member 28 which is accommodated to the diameter of the cylinder 16 is fastened in the cylinder channel 29 to the cylinder 16 by a spindle 30 and a screw 31.

As shown in FIG. 6, a lacquer layer 32 applied by the dipping roller 8 to the metering roller 9 is suitably doctored by the displaceably arranged doctor blade 15 in a manner related to the format of the sheet which is to be printed.

There is claimed:

1. In a printing machine, a medium applicator disposed downstream of printing units of the machine in the travel direction of a sheet which has been printed, the applicator having three rollers including a first roller for taking up medium from a supply container, a second roller for metering a quantity of the medium to be applied, and a third roller having the same diameter as that of cylinders of the printing units for transferring the medium, comprising a rubber lining disposed on the third roller for directly applying the medium onto the printed sheet; the three rollers, during application of the medium, being in constant meshing engagement with a sheet-transferring cylinder; means for uncoupling the three rollers from the sheet-transferring cylinder, and separate motor means for driving the three rollers when said rollers are uncoupled.

2. Medium applicator according to claim 1, wherein the third roller is in the form of a cylinder with a continuous surface.

3. Medium applicator according to claim 2 wherein the rubber lining is a rubber cloth applied in abutting manner on the third roller, the third roller having the same diameter as that of the sheet-transferring cylinder, and the third roller being connected by a single-revolution clutch to said sheet-transferring cylinder.

4. Medium applicator according to claim 1, including a ductor blade disposed on at least one of the end faces of the third roller serving to transfer the medium to the printed sheet, said ductor blade being disposed so that when superfluous medium is removed by the ductor blade, the thus removed superfluous medium can flow back into the supply container.

5. Medium applicator according to claim 1, wherein the third roller is in the form of a cylinder having a channel formed therein; and including an insert member received in said channel so as to complete a continuous cylinder.

6. Medium applicator according to claim 1 including a ductor blade disposed on the second roller for ensuring exact format-related metering of the medium.

* * * * *

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European Patent Office
Office européen des brevets

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(54) A rotary offset printing press

(57) A retractable in-line inking/coating apparatus can apply either spot or overall inking/coating material to a plate and/or a blanket on the first printing unit or on any consecutive printing unit of any rotary offset printing press. The inking/coating apparatus is pivotally mounted within the conventional dampener space of any lithographic printing unit. The aqueous component of the flexographic printing ink or aqueous coating material is evaporated and dried by high velocity, hot air dryers and high performance heat and moisture extractors so that the aqueous or flexographic ink or coating material on a freshly printed or coated sheet is dry and can be dry-trapped on the next printing unit. The inking/coating apparatus includes dual cradles that support first and second applicator rollers (66/67) so that the inking/coating apparatus can apply a double bump of aqueous/flexographic or UV-curable printing ink or coating material to a plate on the plate cylinder (32), while simultaneously applying aqueous, flexographic or UV-curable printing ink or coating material to a plate or a blanket on the blanket cylinder (34), and thereafter onto a sheet as the sheet is transferred through the nip between the blanket cylinder (34) and the impression cylinder (36). A triple bump is printed or coated on the last printing unit with the aid of an impression cylinder inking/coating unit.

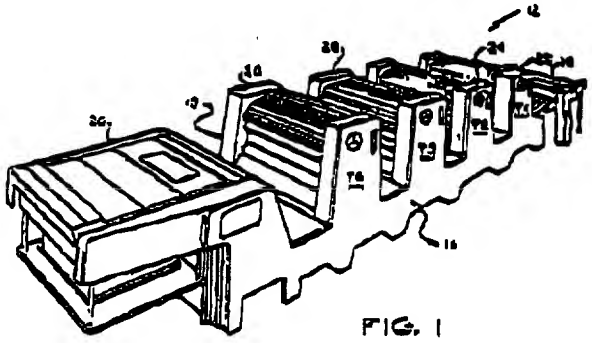

FIG. 1

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2.16.3/3.4

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 96 25 0220

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
D,Y	US 4 615 293 A (HEIDELBERGER DRUCKMASCHINEN AG) * the whole document *	1,2,4,6, 7,15,18	B41F31/18
Y	EP 0 293 586 A (M.A.N.-ROLAND DRUCKMASCHINEN AKTIENGESELLSCHAFT) Abstract; fig.1	1,2,4,7, 15,18	
Y	GB 2 263 438 A (THE LANGSTON CORPORATION) Abstract;fig.1-3	1,2,4,7, 15,18	
Y	CH 319 962 A (MASCHINENFABRIK WINKLER, FALLERT & CO.) * the whole document *	6	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)
B41F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	11 March 1998	Loncke, J

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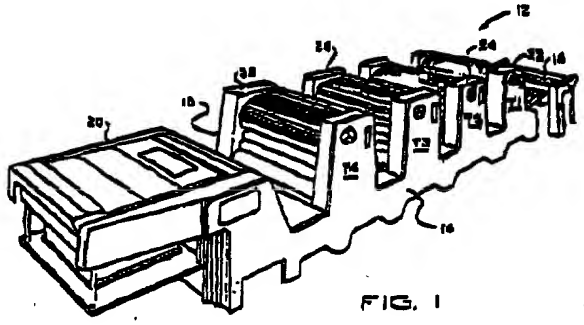

FIG. 1

EP 0 767 057 A2

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Description

Field of the Invention

This invention relates generally to sheet-fed or web-fed, rotary offset lithographic printing presses, and more particularly, to a new and improved inking/coating apparatus for the in-line application of aqueous or flexographic printing inks, primer or protective/decorative coatings applied simultaneously to the plate and blanket of the first or any consecutive printing unit of any lithographic printing press.

Background of the Invention

Conventional sheet-fed, rotary offset printing presses typically include one or more printing units through which individual sheets are fed and printed. After the last printing unit, freshly printed sheets are transferred by a delivery conveyor to the delivery end of the press where the freshly printed and/or coated sheets are collected and stacked uniformly. In a typical sheet-fed, rotary offset printing press such as the Heidelberg Speedmaster line of presses, the delivery conveyor includes a pair of endless chains carrying gripper bars with gripper fingers which grip and pull freshly printed sheets from the last impression cylinder and convey the sheets to the sheet delivery stacker.

Since the inks used with sheet fed rotary offset printing presses are typically wet and tacky, special precautions must be taken to prevent marking and smearing of the freshly printed or coated sheets as the sheets are transferred from one printing unit to another. The printed ink on the surface of the sheet dries relatively slowly and is easily smeared during subsequent transfer between printing units. Marking, smearing and smudging can be prevented by a vacuum assisted sheet transfer apparatus as described in the following U.S. Patents: 5,113,255; 5,127,329; 5,205,217; 5,228,391; 5,243,909; and 5,419,254, all to Howard W. DeMoore, co-inventor, and manufactured and sold by Printing Research, Inc. of Dallas, Texas, U.S.A. under its trademark RACVAC™.

In some printing jobs, offsetting is prevented by applying a protective and/or decorative coating material over all or a portion of the freshly printed sheets. Some coatings are formed of a UV-curable or water-dispersed resin applied as a liquid solution over the freshly printed sheets to protect the ink from offsetting or set-off and improve the appearance of the freshly printed sheets. Such coatings are particularly desirable when decorative or protective finishes are applied in the printing of posters, record jackets, brochures, magazines, folding cartons and the like.

Description of the Prior Art

Various arrangements have been made for applying the coating as an in-line printing operation by using the last printing unit of the press as the coating application unit. For example, U.S. Patents 4,270,463; 4,685,414; and 4,779,557 disclose coating apparatus which can be moved into position to permit the blanket cylinder of the last printing unit of a printing press to be used to apply a coating material over the freshly printed sheets. In U.S. Patent 4,841,903 (Bird) there are disclosed coating apparatus which can be selectively moved between the plate cylinder or the blanket cylinder of the last printing unit of the press so the last printing unit can only be used for coating purposes. However, when coating apparatus of these types are being used, the last printing unit cannot be used to print ink to the sheets, but rather can only be used for the coating operation. Thus, while coating with this type of in-line coating apparatus, the printing press loses the capability of printing on the last printing unit as it is converted to a coating unit.

The coater of U.S. Patent 5,167,790 (Silkar et al) is retractable along an inclined rail for extending and retracting a coater head into engagement with a blanket on the blanket cylinder. Because of its size, the rail-retractable coater can only be installed between the last printing unit of the press and the delivery sheet stacker, and cannot be used for interunit coating. The coater of U.S. Patent 4,815,293 (Jahn) provides two separate, independent coaters located on the dampener side of a converted printing unit for applying lacquer to a plate and to a rubber blanket. Consequently, although a plate and blanket are provided, the coating unit of Jahn's press is restricted to a dedicated coating operation only.

Proposals have been made for overcoming the loss of a printing unit when in-line coating is used, for example as set forth in U.S. Patent 3,176,077 to Howard W. DeMoore (co-inventor and assignee), which discloses a coating apparatus having an applicator roller positioned to apply the coating material to the freshly printed sheet while the sheet is still on the last impression cylinder of the press. This allows the last printing unit to print and coat simultaneously, so that no loss of printing unit capability results.

Some conventional coaters are rail-mounted and occupy a large amount of press space and reduce access to the press. Elaborate equipment is needed for retracting such coaters from the operative coating position to the inoperative position, which reduces access to the printing unit.

Accordingly, there is a need for an in-line inking/coating apparatus which does not result in the loss of a printing unit, does not extend the length of the press, and which can print and coat aqueous and flexographic inks and coating materials simultaneously onto the plate and blanket on any lithographic printing unit of any lithographic printing press, including the first printing unit.

Objects of the Invention

Accordingly, a general object of the present inven-

tion is to provide improved inking/coating apparatus which is capable of selectively applying ink or coating material to a plate on a plate cylinder or ink or coating material to a plate or blanket on a blanket cylinder.

A specific object of the present invention is to provide improved inking/coating apparatus of the character described which is extendable into inking/coating engagement with either a plate on a plate cylinder or to a plate or blanket on a blanket cylinder.

A related object of the present invention is to provide improved inking/coating apparatus of the character described which is capable of being mounted on any lithographic printing unit of the press and does not interfere with operator access to the plate cylinder, blanket cylinder, or adjacent printing units.

Another object of the present invention is to provide improved inking/coating apparatus of the character described, which can be moved from an operative inking/coating engagement position adjacent to a plate cylinder or a blanket cylinder to a non-operative, retracted position.

Still another object of the present invention is to provide improved inking/coating apparatus of the character described, which can be used for applying aqueous, flexographic and ultra-violet curable inks and/or coatings in combination with lithographic, flexographic and waterless printing processes on any rotary offset printing press.

A related object of the present invention is to provide improved, inking/coating apparatus of the character described, which is capable of applying aqueous or flexographic ink or coating material on one printing unit, for example the first printing unit, and drying the ink or coating material before it is printed or coated on the next printing unit so that it can be overprinted or overcoated immediately on the next printing unit with waterless, aqueous, flexographic or lithographic inks or coating materials.

Yet another object of the present invention is to provide improved inking/coating apparatus for use on a multiple color rotary offset printing press that can apply ink or coating material separately and/or simultaneously to the plate and/or blanket of a printing unit of the press from a single operative position, and from a single inking/coating apparatus.

A related object of the present invention is to provide improved inking/coating apparatus of the character described, in which virtually no printing unit adjustment or alteration is required when the inking/coating apparatus is converted from plate to blanket printing or coating and vice versa.

Another object of the present invention is to provide improved inking/coating apparatus that can be operably mounted in the dampener space of any lithographic printing unit for inking/coating engagement with either a plate on a plate cylinder or a plate or blanket on a blanket cylinder, and which does not interfere with operator movement or activities in the interunit space between printing units.

Summary of the Invention

The foregoing objects are achieved by a retractable, inline inking/coating apparatus which is mounted on the dampener side of any printing unit of a rotary offset press for movement between an operative (on-impression) inking/coating position and a retracted, disengaged (off-impression) position. The inking/coating apparatus includes an applicator roller which is movable into and out of engagement with a plate on a plate cylinder or a blanket on a blanket cylinder. The inking/coating applicator head is pivotally coupled to a printing unit by pivot pins which are mounted on the press side frames in the traditional dampener space of the printing unit in parallel alignment with the plate cylinder and the blanket cylinder. This dampener space mounting arrangement allows the inking/coating unit to be installed between any adjacent printing units on the press.

In the preferred embodiment, the applicator head includes vertically spaced pairs of cradle members with one cradle pair being adapted for supporting an inking/coating applicator roller in alignment with a plate cylinder, and the other cradle pair supporting an inking/coating applicator roller in alignment with the blanket cylinder, respectively, when the applicator head is in the operative position. Because of the pivotal support provided by the pivot pins, the applicator head can be extended and retracted within the limited space available in the traditional dampener space, without restricting operator access to the printing unit cylinders and without causing a printing unit to lose its printing capability.

When the inking/coating apparatus is used in combination with a flexographic printing plate and aqueous or flexographic ink or coating material, the water component of the aqueous or flexographic ink or coating material on the freshly printed or coated sheet is evaporated and dried by a high velocity, hot air interunit dryer and a high volume heat and moisture extractor assembly so that the freshly printed ink or coating material is dry before the sheet is printed or coated on the next printing unit. This quick drying process permits a base layer or film of ink, for example opaque white or metallic (gold, silver or other metallics) ink to be printed on the first printing unit, and then overprinted on the next printing unit without back-trapping or dot gain.

The construction and operation of the present invention will be understood from the following detailed description taken in conjunction with the accompanying drawings which disclose, by way of example, the principles and advantages of the present invention.

Brief Description of the Drawings

FIGURE 1 is a perspective view of a sheet fed, rotary offset printing press having inking/coating apparatus embodying the present invention;

FIGURE 2 is a simplified perspective view of the

single head, dual cradle inking/coating apparatus of the present invention:

FIGURE 3 is a schematic side elevational view of the printing press of Figure 1 having single head, dual cradle inking/coating apparatus installed in the traditional dampener position of the first, second and last printing units;

FIGURE 4 is a simplified side elevational view showing the single head, dual cradle inking/coating apparatus in the operative inking/coating position for simultaneously printing on the printing plate and blanket on the fourth printing unit;

FIGURE 5 is a simplified side elevational view showing the single head, dual cradle inking/coating apparatus in the operative position for spot or overall inking or coating on the blanket of the first printing unit, and showing the dual cradle inking/coating apparatus in the operative position for spot or overall inking or coating on the printing plate of the second printing unit;

FIGURE 6 is a simplified side elevational view of the single head, dual cradle inking/coating apparatus of FIGURE 4 and FIGURE 5, partially broken away, showing the single head, dual cradle inking/coating apparatus in the operative coating position and having a sealed doctor blade reservoir assembly for spot or overall coating on the blanket;

FIGURE 7 is a schematic view showing a heat exchanger and pump assembly connected to the single head, dual cradle inking/coating apparatus for circulating temperature controlled ink or coating material to the inking/coating apparatus;

FIGURE 8 is a side elevational view, partially broken away, and similar to FIGURE 6 which illustrates an alternative coating head arrangement;

FIGURE 9 is a simplified elevational view of a printing unit which illustrates pivotal coupling of the inking/coating apparatus on the printing unit side frame members;

FIGURE 10 is a view similar to FIGURE 2 in which a pair of split applicator rollers are mounted in the upper cradle and lower cradle, respectively;

FIGURE 11 is a side elevational view of a split applicator roller;

FIGURE 12 is a perspective view of a doctor blade reservoir which is centrally partitioned by a seal element;

FIGURE 13 is a sectional view showing sealing engagement of the split applicator roller against the partition seal element of FIGURE 12;

FIGURE 14 is a view similar to FIGURE 9 which illustrates an alternative inking/coating embodiment;

FIGURE 15 is a simplified side elevational view of a substrate which has a bronzed-like finish which is applied by simultaneous operation of the dual applicator roller embodiment of FIGURE 14;

FIGURE 16 is a side elevational view, partly in section, of a pan roller having separate transfer surfaces mounted on a split fountain pan;

FIGURE 17 is a simplified side elevational view of the dual cradle inking/coating apparatus, partially broken away, which illustrates an alternative inking/coating head apparatus featuring a single doctor blade assembly, anilox applicator roller mounted on the lower cradle; and

FIGURE 18 is a side elevational view, partly in section, of a single doctor blade anilox applicator roller assembly having separate transfer surfaces, and a split fountain pan having separate fountain compartments, with the separate fountain compartments being supplied with different inks or coating materials from separate off-press sources.

Detailed Description of the Preferred Embodiments

As used herein, the term "processed" refers to printing and coating methods which can be applied to either side of a substrate, including the application of lithographic, waterless, UV-curable, aqueous and flexographic inks and/or coatings. The term "substrate", refers to sheet and web material. Also, as used herein, the term "waterless printing plate" refers to a printing plate having image areas and non-image areas which are oleophilic and oleophobic, respectively. "Waterless printing ink" refers to an oil-based ink which does not contain a significant aqueous component. "Flexographic plate" refers to a flexible printing plate having a relief surface which is wettable by flexographic ink or coating material. "Flexographic printing ink or coating material" refers to an ink or coating material having a base constituent of either water, solvent or UV-curable liquid. "UV-curable lithographic printing ink and coating material" refers to oil-based printing inks and coating materials that can be cured (dried) photomechanically by exposure to ultraviolet radiation, and that have a semi-paste or gel-like consistency. "Aqueous printing ink or coating material" refers to an ink or coating material that predominantly contains water as a solvent, diluent or vehicle. A "relief plate" refers to a printing plate having image areas which are raised relative to non-image areas which are recessed.

As shown in the exemplary drawings, the present invention is embodied in a new and improved in-line inking/coating apparatus, herein generally designated 10, for applying aqueous, flexographic or UV-curable inks or protective and/or decorative coatings to sheets or webs printed in a sheet-fed or web-fed, rotary offset printing press, herein generally designated 12. In this instance, as shown in FIGURE 1, the inking/coating apparatus 10 is installed in a four unit rotary offset printing press 12, such as that manufactured by Heidelberger Druckmaschinen AG of Germany under its designation Heidelberg Speedmaster SM102 (40", 102cm).

The press 12 includes a press frame 14 coupled at one end, herein the right end, to a sheet feeder 15 from which sheets, herein designated S, are individually and sequentially fed into the press, and at the opposite end,

with a sheet delivery stacker 20 in which the freshly printed sheets are collected and stacked. Interposed between the sheet feeder 16 and the sheet delivery stacker 20 are four substantially identical sheet printing units 22, 24, 26 and 28 which can print four different colors onto the sheets as they are transferred through the press 12. The printing units are housed within printing towers T1, T2, T3 and T4 formed by side frame members 14, 15. Each printing tower has a delivery side 29 and a dampener side 27. A dampener space 29 is partially enclosed by the side frames on the dampener side of the printing unit.

As illustrated, the printing units 22, 24, 26 and 28 are substantially identical and of conventional design. The first printing unit 22 includes an in-feed transfer cylinder 30, a plate cylinder 32, a blanket cylinder 34 and an impression cylinder 36, all supported for rotation in parallel alignment between the press side frames 14, 15 which define printing unit towers T1, T2, T3 and T4. Each of the first three printing units 22, 24 and 26 have a transfer cylinder 38 disposed to transfer the freshly printed sheets from the adjacent impression cylinder and transfer the freshly printed sheets to the next printing unit via an intermediate transfer drum 40.

The last printing unit 28 includes a delivery cylinder 42 mounted on a delivery shaft 43. The delivery cylinder 42 supports the freshly printed sheet 18 as it is transferred from the last impression cylinder 36 to a delivery conveyor system, generally designated 44, which transfers the freshly printed sheet to the sheet delivery stacker 20. To prevent smearing during transfers a flexible covering is mounted on the delivery cylinder 42, as described and claimed in U.S. Patent 4,402,267 to Howard W. DeMoore, which is incorporated herein by reference. The flexible covering is manufactured and sold by Printing Research, Inc. of Dallas, Texas, U.S.A. under its trademark SUPER BLUE®. Optionally, a vacuum-assisted sheet transfer assembly manufactured and sold by Printing Research, Inc. of Dallas, Texas, U.S.A., under its trademark RACVAC® can be substituted for the delivery transfer cylinder 42 and flexible covering.

The delivery conveyor system 44 as shown in FIGURE 2 is of conventional design and includes a pair of endless delivery gripper chains 46, only one of which is shown carrying at regular spaced locations along the chains, laterally disposed gripper bars having gripper fingers used to grip the leading edge of a freshly printed or coated sheet 18 after it leaves the nip between the impression cylinder 36 and delivery cylinder 42 of the last printing unit 28. As the leading edge is gripped by the gripper fingers, the delivery chains 46 pull the sheet away from the last impression cylinder 36 and convey the freshly printed or coated sheet to the sheet delivery stacker 20.

Prior to reaching the delivery sheet stacker, the freshly printed and/or coated sheets S pass under a delivery dryer 48 which includes a combination of infrared thermal radiation, high velocity hot air flow and a high performance heat and moisture extractor for drying the ink and/or the protective/decorative coating. Preferably, the delivery dryer 48, including the high performance heat and moisture extractor is constructed as described in U.S. Application Serial Number 08/116,711, filed September 3, 1993, entitled "Infra-Red Forced Air Dryer and Extractor" by Howard C. Secor, Ronald M. Rendleman and Paul D. Copenhaver, commonly assigned to the assignee of the present invention, Howard W. DeMoore, and licensed to Printing Research, Inc. of Dallas, Texas, U.S.A., which manufactures and markets the delivery dryer 48 under its trademark AIR BLANKET™.

In the exemplary embodiment shown in FIGURE 3, the first printing unit 22 has a flexographic printing plate PF mounted on the plate cylinder, and therefore neither an inking roller train nor a dampening system is required. A flexographic printing plate PF is also mounted on the plate cylinder of the second printing unit 24. The form rollers of the inking roller train 52 shown mounted on the second printing unit 24 are retracted and locked off to prevent plate contact. Flexographic ink is supplied to the flexographic plate PF of the second printing unit 24 by the inking/coating apparatus 10.

A suitable flexographic printing plate PF is offered by E.I. du Pont de Nemours of Wilmington, Delaware, U.S.A., under its trademark CYREL®. Another source is BASF Aktiengesellschaft of Ludwigshafen, Germany, which offers a suitable flexographic printing plate under its trademark NYLOFLEX®.

The third printing unit 26 as illustrated in FIGURE 3 and FIGURE 4 is equipped for lithographic printing and includes an inking apparatus 50 having an inking roller train 52 arranged to transfer ink Q from an ink fountain 54 to a lithographic plate P mounted on the plate cylinder 32. This is accomplished by a fountain roller 56 and a ductor roller 57. The fountain roller 56 projects into the ink fountain 54, whereupon its surface picks up ink. The lithographic printing ink Q is transferred from the fountain roller 56 to the inking roller train 52 by the ductor roller 57. The inking roller train 52 supplies ink Q to the image areas of the lithographic printing plate P.

The lithographic printing ink Q is transferred from the lithographic printing plate P to an ink receptive blanket B which is mounted on the blanket cylinder 34. The inked image carried on the blanket B is transferred to a substrate S as the substrate is transferred through the nip between the blanket cylinder 34 and the impression cylinder 36.

The inking roller arrangement 52 illustrated in FIGURE 3 and FIGURE 4 is exemplary for use in combination with lithographic ink printing plates P. It is understood that a dampening system 58 having a dampening fluid reservoir DF is coupled to the inking roller train 52 (FIGURE 4), but is not required for waterless or flexographic printing.

The plate cylinder 32 of printing unit 26 is equipped with a waterless printing plate PW. Waterless printing plates are also referred to as dry planographic printing

plates and are disclosed in the following U.S. patents: 3,910,187; Re. 30,670; 4,086,863; and 4,859,513. Suitable waterless printing plates can be obtained from Toray Industries, Inc. of Tokyo, Japan. A dampening system is not used for waterless printing, and waterless (oil-based) printing ink is used. The waterless printing plate PW has image areas and non-image areas which are oleophilic/hydrophilic and oleophobic/hydrophobic, respectively. The waterless printing plate PW is engraved or etched, with the image areas being recessed with respect to the non-image areas. The image area of the waterless printing plate PW is rolled-up with the flexographic or aqueous printing ink which is transferred by the applicator roller 66. Both aqueous and oil-based inks and coatings are repelled from the non-image areas, and are retained in the image areas. The printing ink or coating is then transferred from the image areas to an ink or coating receptive blanket B and is printed or coated onto a substrate S.

For some printing jobs, a flexographic plate PF or a waterless printing plate PW is mounted over a resilient packing such as the blanket B on the blanket cylinder 34, for example as indicated by phantom lines in printing unit 22 of FIGURE 5. An advantage of this alternative embodiment is that the waterless plate PW or the flexographic plate PF are resiliently supported over the blanket cylinder by the underlying blanket B or other resilient packing. The radial deflection and give of the resilient blanket B provides uniform, positive engagement between the applicator roller 66 and a flexographic plate or waterless plate.

In that arrangement, a plate is not mounted on the plate cylinder, 32; instead, a waterless plate PW is mounted on the blanket cylinder, and the inked image on the waterless printing plate is not offset but is instead transferred directly from the waterless printing plate PW to the substrate S. The water component of flexographic ink on the freshly printed sheet is evaporated by high velocity, hot air dryers and high volume heat and moisture extractors so that the freshly printed aqueous or flexographic ink is dried before the substrate is printed on the next printing unit.

Referring now to FIGURE 2, FIGURE 3 and FIGURE 9, the inking/coating apparatus 10 is pivotally mounted on the side frames 14, 16 for rotation about an axis X. The inking/coating apparatus 10 includes a frame 60, a hydraulic motor 62, a lower gear train 64, an upper gear train 65, an applicator roller 66, a metal doctor blade assembly 68 (FIGURE 6), and a drip pan DP, all mounted on the frame 60. The external peripheral surface of the applicator roller 66 is wetted by contact with liquid coating material or ink contained in a reservoir 70.

The hydraulic motor 62 drives the applicator roller 66 synchronously with the plate cylinder 32 and the blanket cylinder 34 in response to an RPM control signal from the press drive (not illustrated) and a feedback signal developed by a tachometer 72. While a hydraulic drive motor is preferred, other drive means such as an electric drive motor or an equivalent can be used.

When using waterless printing plate systems, the temperature of the waterless printing ink and of the waterless printing plate must be closely controlled for good image reproduction. For example, for waterless offset printing with TORAY waterless printing plates PW, it is absolutely necessary to control the waterless printing plate surface and waterless ink temperature to a very narrow range, for example 24°C (75°F) to 27°C (80°F).

Referring to FIGURE 7, the reservoir 70 is supplied with ink or coating which is temperature controlled by a heat exchanger 71. The temperature controlled ink or coating material is circulated by a positive displacement pump, for example a peristaltic pump, through the reservoir 70 and heat exchanger 71 from a source 73 through a supply conduit 75 and a return conduit 77. The heat exchanger 71 cools or heats the ink or coating material and maintains the ink or coating and the printing plate within the desired narrow temperature range.

According to one aspect of the present invention, aqueous/flexographic ink or coating material is supplied to the applicator roller 66, which transfers the aqueous/flexographic ink or coating material to the printing plate (FIGURE 7), which may be a waterless printing plate or a flexographic printing plate. When the inking/coating apparatus is used for applying aqueous/flexographic ink or coating material to a waterless printing plate PW, the inking roller train 62 is not required, and is retracted away from the printing plate. Because the viscosity of aqueous/flexographic printing ink or coating material varies with temperature, it is necessary to heat or cool the aqueous/flexographic printing ink or coating material to compensate for ambient temperature variations to maintain the ink viscosity in a preferred operating range.

For example, the temperature of the printing press can vary from around 60°F (15°C) in the morning, to around 85°F (29°C) or more in the afternoon. The viscosity of aqueous/flexographic printing ink or coating material can be marginally high when the ambient temperature of the press is near 60°F (15°C), and the viscosity can be marginally low when the ambient temperature of the press exceeds 85°F (29°C). Consequently, it is desirable to control the temperature of the aqueous/flexographic printing ink or coating material so that it will maintain the surface temperature of waterless printing plates within the specified temperature range. Moreover, the ink/coating material temperature should be controlled to maintain the tack of the aqueous/flexographic printing ink or coating material within a desired range when the ink or coating material is being used in connection with flexographic printing processes.

The applicator roller 66 is preferably an anilox fluid metering roller which transfers measured amounts of printing ink or coating material to a plate or blanket. The surface of an anilox roller is engraved with an array of closely spaced, shallow depressions referred as: "cells". Ink or coating from the reservoir 70 flows into the cells

as the anilox roller turns through the reservoir. The transfer surface of the anilox roller is "doctored" (wiped or scraped) by dual doctor blades 68A, 68B to remove excess ink or coating material. The ink or coating metered by the anilox roller is that contained within the cells. The dual doctor blades 68A, 68B also seal the supply reservoir 70.

The anilox applicator roller 66 is cylindrical and may be constructed in various diameters and lengths, containing cells of various sizes and shapes. The volumetric capacity of an anilox roller is determined by cell size, shape and number of cells per unit area. Depending upon the intended application, the cell pattern may be fine (many small cells per unit area) or coarse (fewer large cells per unit area).

By supplying the ink or coating material through the inking/coating apparatus 10, more ink or coating material can be applied to the sheet S as compared with the inking roller train of a lithographic printing unit. Moreover, color intensity is stronger and more brilliant because the aqueous or flexographic ink or coating material is applied at a much heavier film thickness or weight than can be applied by the lithographic process, and the aqueous or flexographic colors are not diluted by dampening solution.

Preferably, the sealed doctor blade assembly 68 is constructed as described in U.S. Patent 5,176,077 to Howard W. DeMoore, co-inventor and assignee, which is incorporated herein by reference. An advantage of using a sealed reservoir is that fast drying ink or coating material can be used. Fast drying ink or coating material can be used in an open fountain 53 (see FIGURE 8); however, open air exposure causes the water and solvents in the fast-drying ink or coating material to evaporate faster, thus causing the ink or coating material to dry prematurely and change viscosity. Moreover, an open fountain emits unwanted odors into the press room. When the sealed doctor blade assembly is utilized, the pump (FIGURE 7) which circulates ink or coating material to the doctor blade head is preferably a peristaltic pump, which does not inject air into the feeder lines which supply the ink or coating reservoir 70 and helps to prevent the formation of air bubbles and foam within the ink or coating material.

An inking/coating apparatus 10 having an alternative applicator roller arrangement is illustrated in FIGURES 10-13. In this arrangement, the engraved metering surface of the anilox applicator rollers 66, 67 are partitioned by smooth seal surfaces 66C which separates a first engraved peripheral surface portion 66A from a second engraved peripheral surface portion 66B. Likewise, smooth seal surfaces 66D, 66E are formed on the opposite end portions of the applicator roller 66 for engaging end seals 134, 136 (FIGURE 12) of the doctor blade reservoir. The upper applicator roller 67 has engraved anilox metering surfaces 67A and 67B which are separated by a smooth seal band 67C.

Referring now to FIGURE 12 and FIGURE 13, the reservoir 70 of the doctor blade head 68 is partitioned by a curved seal element 130 to form two separate chambers 70A, 70B. The seal element 130 is secured to the doctor blade head within an annular groove 132. The seal element 130 is preferably made of polyurethane foam or other durable, resilient foam material. The seal element 130 is engaged by the seal band 66, thus forming a rotary seal which blocks the leakage of ink or coating material from one reservoir chamber into the other reservoir chamber. Moreover, the seal band provides an unprinted or uncoated area which separates the printed or coated areas from each other, which is needed for work and turn printing jobs or other printing jobs which print two or more separate images onto the same substrate.

Another advantage of the split applicator roller embodiment is that it enables two or more flexographic inks or coating materials to be printed simultaneously within the same lithographic printing unit. That is, the reservoir chambers 70A, 70B of the upper doctor blade assembly can be supplied with gold ink and silver ink, for example, while the reservoir chambers 70A, 70B of the lower doctor blade assembly can be supplied with inks of two additional colors for example opaque white ink and blue ink. This permits the opaque white ink to be overprinted with the gold ink, and the blue ink to be overprinted with the silver ink on the same printing unit on any lithographic press.

Moreover, a catalyst can be used in the upper doctor blade reservoir and a reactive ink or coating material can be used in the lower doctor blade reservoir. This can provide various effects, for example improved chemical resistance and higher gloss levels.

The split applicator roller sections 67A, 67B in the upper cradle position can be used for applying two separate inks or coating materials simultaneously, for example flexographic, aqueous and ultra-violet curable inks or coating materials, to separate surface areas of the plate, while the lower applicator roller sections 66A, 66B can apply an initiator layer and a micro-encapsulated layer simultaneously to separate blanket surface areas. Optionally, the metering surface portions 66A, 66B can be provided with different cell metering capabilities for providing different printing effects which are being printed simultaneously. For example, the screen line count on one half-section of an anilox applicator roller is preferably in the range of 200-600 lines per inch (79-236 lines per cm) for half-tone images, and the screen line count of the other half-section is preferably in the range of 100-300 lines per inch (39-118 lines per cm) for overall coverage, high weight applications such as opaque white. This split arrangement in combination with dual applicator rollers is particularly advantageous when used in connection with "work and turn" printing jobs.

Referring again to FIGURE 8, instead of using the sealed doctor blade reservoir assembly 68 as shown in FIGURE 8, an open fountain assembly 69 is provided by the fountain pan 53 which contains a volume of liquid ink O or coating material. The liquid ink or coating material

is transferred to the applicator roller 66 by a pan roller 55 which turns in contact with ink Q or coating material in the fountain pan. If a split applicator roller is used, the pan roller 55 is also split, and the pan is divided into two pan sections 53A, 53B by a separator plate 53P, as shown in FIGURE 16.

In the alternative embodiment of FIGURE 16, the pan roller 55 is divided into two pan roller sections 55A, 55B by a centrally located, annular groove 59. The separator plate 53P is received within and centrally aligned with the groove 59, but does not touch the adjoining roller faces. By this arrangement, two or more inks or coating materials Q1, Q2 are contained within the open pan sections 55A, 55B for transfer by the split pan roller sections 53A, 53B, respectively. This permits two or more flexographic inks or coating materials to be transferred to two separate image areas on the plate or on the blanket of the same printing unit. This arrangement is particularly advantageous for work and turn printing jobs or other printing jobs which print two or more separate images onto the same substrate.

The frame 60 of the inking/coating apparatus 10 includes side support members 74, 76 which support the applicator roller 66, gear train 64, gear train 65, doctor blade assembly 68 and the drive motor 62. The applicator roller 66 is mounted on stub shafts 93A, 93B which are supported at opposite ends on a lower cradle assembly 100 formed by a pair of side support members 78, 80 which have sockets 79, 81 and retainer caps 101, 103. The stub shafts are received in roller bearings 105, 107 which permit free rotation of the applicator roller 66 about its longitudinal axis A1 (axis A2 in the upper cradle). The retainer caps 101, 103 hold the stub shafts 93A, 93B and bearings 105, 107 in the sockets 79, 81 and hold the applicator roller 66 in parallel alignment with the pivot axis X.

The side support members 74, 76 also have an upper cradle assembly 102 formed by a pair of side support members 82, 84 which are vertically spaced with respect to the lower side plates 78, 80. Each cradle 100, 102 has a pair of sockets 79, 81 and 83, 85, respectively, for holding an applicator roller 66, 67 for spot coating or inking engagement with the printing plate P on the plate cylinder 32 (FIGURE 4) or with a printing plate P or a blanket B on the blanket cylinder 34.

Preferably, the applicator roller 67 (FIGURE 8, FIGURE 9) the upper cradle (plate) position is an anilox roller having a resilient transfer surface. In the dual cradle arrangement as shown in FIGURE 2, the press operator can quickly change from blanket inking/coating to plate inking/coating within minutes, since it is only necessary to release, remove and reposition or replace the applicator roller 66.

The capability to simultaneously print in the flexographic mode, the aqueous mode, the waterless mode, or the lithographic mode on different printing units of the same lithographic press and to print or coat from either the plate position or the blanket position on any one of the printing units is referred to herein as the LITHOFLEX™ printing process or system. LITHOFLEX™ is a trademark of Printing Research, Inc. of Dallas, Texas, U.S.A., exclusive licensee of the present invention.

Referring now to FIGURE 14, an inking/coating apparatus 10 having an inking/coating assembly 109 of an alternative design is installed in the upper cradle position for applying ink and/or coating material to a plate P on the plate cylinder 32. According to this alternative embodiment, an applicator roller 67R having a resilient transfer surface is coupled to an anilox fluid metering roller which transfers measured amounts of printing ink or coating material to the plate P. The anilox roller 111 has a transfer surface constructed of metal, ceramic or composite material which is engraved with cells. The resilient applicator roller 67R is interposed in transfer engagement with the plate P and the metering surface of the anilox roller 111. The resilient transfer surface of the applicator roller 67R provides uniform, positive engagement with the plate.

Referring now to FIGURE 17, an inking/coating apparatus 10 having an alternative inking/coating assembly 113 is installed in the lower cradle assembly 100 for applying flexographic or aqueous ink and/or coating material Q to a plate or blanket mounted on the blanket cylinder 34. Instead of using the sealed, dual doctor blade reservoir assembly 68 as shown in FIGURE 6, an open, single doctor blade anilox roller assembly 113 is supplied with liquid ink Q or coating material contained in an open fountain pan 117. The liquid ink or coating material Q is transferred to the engraved transfer surface of the anilox roller 66 as it turns in the fountain pan 117. Excess ink or coating material Q is removed from the engraved transfer surface by a single doctor blade 68B. The liquid ink or coating material Q is pumped from an off-press source, for example the drum 73 shown in FIGURE 17, through a supply conduit 119 into the fountain pan 117 by a pump 120.

For overall inking or coating jobs, the metering transfer surface of the anilox roller 66 extends over its entire peripheral surface. However, for certain printing jobs which print two or more separate images onto the same substrate, for example work and turn printing jobs, the metering transfer surface of the anilox applicator roller 66 is partitioned by a centrally located, annular undercut groove 66C which separates first and second metering transfer surfaces 66A, 66B as shown in FIGURE 11 and FIGURE 18.

The single doctor blade 68B has an edge 68E which wipes simultaneously against the split metering transfer surfaces 66A, 66B. In this single blade, split anilox roller embodiment 113, it is necessary to provide dual supply sources, for example drums 73A, 73B, dual supply lines 119A, 119B, and dual pumps 120A, 120B. Moreover, the fountain pan 117 is also split, and the pan 117 is divided into two pan sections 117A, 117B by a separator plate 121, as shown in FIGURE 18. The separator plate 121 is centrally aligned with the undercut

groove 66C, but does not touch the adjoining roller faces.

Although the single blade, split anilox applicator roller assembly 113 is shown mounted in the lower cradle position (FIGURE 17), it should be understood that the single blade, split anilox applicator roller assembly 113 can be mounted and used in the upper cradle position, as well.

According to another aspect of the present invention, the inking/coating apparatus 10 is pivotally coupled on horizontal pivot pins 88P, 90P which allows the single head, dual cradle inking/coating apparatus 10 to be mounted on any lithographic printing unit. Referring to FIGURE 9, the horizontal pivot pins 88P, 90P are mounted within the traditional dampener space 29 of the printing unit and are secured to the press side frames 14, 15, respectively. Preferably, the pivot support pins 88P, 90P are secured to the press side frames by a threaded fastener. The pivot support pins are received within circular openings 86, 90 which intersect the side support members 74, 76 of the inking/coating apparatus 10. The horizontal support pins 88P, 90P are disposed in parallel alignment with rotational axis X and with the plate cylinder and blanket cylinder, and are in longitudinal alignment with each other.

Preferably, the pivot pins 88P, 90P are located in the dampener space 29 so that the rotational axes A1, A2 of the applicator rollers 66, 67 are elevated with respect to the nip contact points N1, N2. By that arrangement, the transfer point between the applicator roller 66 and a blanket on the blanket cylinder 34 (as shown in FIGURE 8) and the transfer point between the applicator roller 66 and a plate on the plate cylinder 32 (as shown in FIGURE 5) are above the radius lines R1, R2 of the plate cylinder and the blanket cylinder, respectively. This permits the inking/coating apparatus 10 to move clockwise to retract the applicator roller 66 to an off-impression position relative to the blanket cylinder in response to a single extension stroke of the power actuator arms 104A, 106A. Similarly, the applicator roller 66 is moved counterclockwise to the on-impression operative position as shown in FIGURES 4, 5, 6 and 8 by a single retraction stroke of the actuator arms 104A, 106A, respectively.

Preferably, the pivot pins are made of steel and the side support members are made of aluminum, with the steel pivot pins and the aluminum collar portion bordering the circular openings 86, 90 forming a low friction journal. By this arrangement, the inking/coating apparatus 10 is freely rotatable clockwise and counterclockwise with respect to the pivot pins 88P, 90P. Typically, the arc length of rotation is approximately 60 mils (about 1.5 mm). Consequently, the inking/coating apparatus 10 is almost totally enclosed within the dampener space 29 of the printing unit in the on-impression position and in the off-impression position.

The cradle assemblies 100 and 102 position the applicator roller 66 in inking/coating alignment with the plate cylinder or blanket cylinder, respectively, when the inking/coating apparatus 10 is extended to the operative (on-impression) position. Moreover, because the inking/coating apparatus 10 is installed within the dampener space 29, it is capable of freely rotating through a small arc while extending and retracting without being obstructed by the press side frames or other parts of the printing press. This makes it possible to install the inking/coating apparatus 10 on any lithographic printing unit. Moreover, because of its internal mounting position within the dampener space 29, the projection of the inking/coating apparatus 10 into the space between printing units is minimal. This assures unrestricted operator access to the printing unit when the applicator head is in the operative (on-impression) and retracted (off-impression) positions.

As shown in FIGURE 4 and FIGURE 5, movement of the inking/coating apparatus 10 is counterclockwise from the retracted (off-impression) position to the operative (on-impression) position.

Although the dampener side installation is preferred, the inking/coating apparatus 10 can be adapted for operation on the delivery side of the printing unit, with the inking/coating apparatus being movable from a retracted (off-impression) position to an on-impression position for engagement of the applicator roller with either a plate on the plate cylinder or a blanket on the blanket cylinder on the delivery side 25 of the printing unit.

Movement of the inking/coating apparatus 10 to the operative (on-impression) position is produced by power actuators, preferably double acting pneumatic cylinders 104, 106 which have extendable/retractable power transfer arms 104A, 106A, respectively. The first pneumatic cylinder 104 is pivotally coupled to the press frame 14 by a pivot pin 108, and the second pneumatic cylinder 106 is pivotally coupled to the press frame 15 by a pivot pin 110. In response to selective actuation of the pneumatic cylinders 104, 106, the power transfer arms 104A, 106A are extended or retracted. The power transfer arm 104A is pivotally coupled to the side support member 74 by a pivot pin 112. Likewise, the power transfer arm 106A is pivotally coupled to the side support member 76 by a pivot pin 114.

As the power arms extend, the inking/coating apparatus 10 is rotated clockwise on the pivot pins 88P, 90P, thus moving the applicator roller 66 to the off-impression position. As the power arms retract, the inking/coater apparatus 60 is rotated counterclockwise on the pivot pins 88P, 90P, thus moving the applicator roller 66 to the on-impression position. The torque applied by the pneumatic actuators is transmitted to the inking/coating apparatus 10 through the pivot pin 112 and pivot pin 114.

Fine adjustment of the on-impression position of the applicator roller relative to the plate cylinder or the blanket cylinder, and of the pressure of roller engagement, is provided by an adjustable stop assembly 115. The adjustable stop assembly 115 has a threaded bolt 116 which is engagable with a bell crank 118. The bell

crank 118 is pivotally coupled to the side support member 74 on a pin 120. One end of the bell crank 118 is engagable by the threaded bolt 116, and a cam roller 122 is mounted for rotation on its opposite end. The striking point of engagement is adjusted by rotation of the bolt 116 so that the applicator roller 66 is properly positioned for inking/coating engagement with the plate P or blanket B and provides the desired amount of inking/coating pressure when the inking/coating assembly 60 is moved to the operative position.

This arrangement permits the in-line inking/coating apparatus to operate effectively without encroaching in the interunit space between any adjacent printing units, and without blocking or obstructing access to the cylinders of the printing units when the inking/coating apparatus is in the extended (off-impression) position or retracted (on-impression) position. Moreover, when the in-line inking/coating apparatus is in the retracted position, the doctor blade reservoir and coating circulation lines can be drained and flushed automatically while the printing press is running as well as when the press has been stopped for change-over from one job to another or from one type of ink or coating to another.

Substrates which are printed or coated with aqueous flexographic printing inks require high velocity hot air for drying. When printing a flexographic ink such as opaque white or metallic gold, it is always necessary to dry the printed substrates between printing units before overprinting them. According to the present invention, the water component on the surface of the freshly printed or coated substrate S is evaporated and dried by high velocity, hot air interunit dryer and high volume heat and moisture extractor units 124, 126 and 128, as shown in FIGURE 2, FIGURE 4 and FIGURE 5. The dryer/extractor units 124, 126 and 128 are oriented to direct high velocity heated air onto the freshly printed/coated substrates as they are transferred by the impression cylinder 36 and the intermediate transfer drum 40 of one printing unit and to another transfer cylinder 30 and to the impression cylinder 36 of the next printing unit. By this arrangement, the freshly printed flexographic ink or coating material is dried before the substrate S is overprinted by the next printing unit.

The high velocity, hot air dryer and high performance heat and moisture extractor units 124, 126 and 128 utilize high velocity air jets which scrub and break-up the moist air layer which clings to the surface of each freshly printed or coated sheet or web. Within each dryer, high velocity air is heated as it flows across a resistance heating element within an air delivery baffle tube. High velocity jets of hot air are discharged through multiple airflow apertures into an exposure zone Z (FIGURE 4 and FIGURE 5) and onto the freshly printed/coated sheet S as it is transferred by the impression cylinder 36 and transfer drum 40, respectively.

Each dryer assembly includes a pair of air delivery dryer heads 124D, 126D and 128D which are arranged in spaced, side-by-side relationship. The high velocity, hot air dryer and high performance heat and moisture extractor units 124, 126 and 128 are preferably constructed as disclosed in co-pending U.S. Patent Application Serial No. 08/132,584, filed October 6, 1993, entitled "High Velocity Hot Air Dryer", to Howard W. DeMoore, co-inventor and assignee of the present invention, and which is incorporated herein by reference, and which is marketed by Prinking Research, Inc, of Dallas, Texas, U.S.A., under its trademark SUPER BLUE HV™.

The hot moisture-laden air displaced from the surface of each printed or coated sheet is extracted from the dryer exposure zone Z and exhausted from the printing unit by the high volume extractors 124, 126 and 128. Each extractor head includes an extractor manifold 124E, 126E and 128E coupled to the dryer heads 124D, 126D and 128D and draws the moisture, volatiles, odors and hot air through a longitudinal air gap G between the dryer heads. Best results are obtained when extraction is performed simultaneously with drying. Preferably, an extractor is closely coupled to the exposure zone Z at each dryer location as shown in FIGURE 4. Extractor heads 124E, 126E and 128E are mounted on the dryer heads 124D, 126D and 128D, respectively, with the longitudinal extractor air gap G facing directly into the exposure zone Z. According to this arrangement, each printed or coated sheet is dried before it is printed on the next printing unit.

The aqueous water-based inks used in flexographic printing evaporate at a relatively moderate temperature provided by the interunit high velocity hot air dryers/extractors 124, 126 and 128. Sharpness and print quality are substantially improved since the flexographic ink or coating material is dried before it is overprinted on the next printing unit. Since the freshly printed flexographic ink is dry, dot gain is substantially reduced and back-trapping on the blanket of the next printing unit is virtually eliminated. This interunit drying/extracting arrangement makes it possible to print flexographic inks such as metallic ink and opaque white ink on the first printing unit, and then dry-trap and overprint on the second and subsequent printing units.

Moreover, this arrangement permits the first printing unit 22 to be used as a coater in which a flexographic, aqueous or UV-curable coating material is applied to the lowest grade substrate such as recycled paper, cardboard, plastic and the like, to trap and seal in lint, dust, spray powder and other debris and provide a smoother, more durable printing surface which can be overprinted on the next printing unit.

A first down (primer) aqueous coating layer seals-in the surface of a low grade, rough substrate, for example, re-cycled paper or plastic, and improves overprinted dot definition and provides better ink lay-down while preventing strike-through and show-through. A flexographic UV-curable coating material can then be applied downstream over the primer coating, thus producing higher coating gloss.

Preferably, the applicator roller 66 is constructed of composite carbon fiber material, metal or ceramic

coated metal when it is used for applying ink or coating material to the blanket B or other resilient material on the blanket cylinder 34. When the applicator roller 66 is applied to the plate, it is preferably constructed as an anilox roller having a resilient, compressible transfer surface. Suitable resilient roller surface materials include Buna N synthetic rubber and EPDM (terpolymer elastomer).

It has been demonstrated in prototype testing that the inking/coating apparatus 10 can apply a wide range of ink and coating types, including fluorescent (Day Glo), pearlescent, metallics (gold, silver and other metals), glitter, scratch and sniff (micro-encapsulated fragrance), scratch and reveal, luminous, pressure-sensitive adhesives and the like, as well as UV-curable and aqueous coatings.

With the dampener assembly removed from the printing unit, the inking/coating apparatus 10 can easily be installed in the dampener space for selectively applying flexographic inks and/or coatings to a flexographic or waterless printing plate or to the blanket. Moreover, overprinting of the flexographic inks and coatings can be performed on the next printing unit since the flexographic inks and/or coatings are dried by the high velocity, hot air interunit dryer and high volume heat and moisture extractor assembly of the present invention.

The flexographic inks and coatings as used in the present invention contain colored pigments and/or soluble dyes, binders which fix the pigments onto the surface of the substrate, waxes, defoamers, thickeners and solvents. Aqueous printing inks predominantly contain water as a diluent and/or vehicle. The thickeners which are preferred include alginates, starch, cellulose and its derivatives, for example cellulose esters or cellulose ethers and the like. Coloring agents including organic as well as inorganic pigments may be derived from dyes which are insoluble in water and solvents. Suitable binders include acrylates and/or polyvinylchloride.

When metallic inks are printed, the cells of the anilox roller must be appropriately sized to prevent the metal particles from getting stuck within the cells. For example, for metallic gold ink, the anilox roller should have a screen line count in the range of 175-300 lines per inch (68-118 lines per cm). Preferably, in order to keep the anilox roller cells clear, the doctor blade assembly 66 is equipped with a bristle brush BR (FIGURE 14) as set forth in U.S Patent 5,425,809 to Steven M. Person, assigned to Howard W. DeMoore, and licensed to Printing Research, Inc. of Dallas, Texas, U.S.A., which is incorporated herein by reference.

The inking/coating apparatus 10 can also apply UV-curable inks and coatings. If UV-curable inks and coatings are utilized, ultra-violet dryers/extractors are installed adjacent to the high velocity hot air dryer/extractor units 124, 126 and 128, respectively.

It will be appreciated that the LITHOFLEX™ printing process described herein makes it possible to selectively operate a printing unit of a press in the lithographic printing mode while simultaneously operating another printing unit of the same press in either the flexographic printing mode or in the waterless printing mode, while also providing the capability to print or coat, separately or simultaneously, from either the plate position or the blanket position. The dual cradle support arrangement of the present invention makes it possible to quickly change over from inking/coating on the blanket cylinder position to inking/coating on the plate cylinder position with minimum press down-time, since it is only necessary to remove and reposition or replace the applicator roller 66 while the inking/coating apparatus 10 is in the retracted position. It is only necessary to remove four cap screws, lift the applicator roller 66 from the cradle, and reposition it in the other cradle. All of this can be accomplished in a few minutes, without removing the inking/coating apparatus 10 from the press.

It is possible to spot coat or overall coat from the plate position or from the blanket position with flexographic inks or coatings on one printing unit and then spot coat or overall coat with UV-curable inks or coatings from the plate position or from the blanket position on another printing unit during the same press run. Moreover, the press operator can spot or overall coat from the plate for one job, and then spot and/or overall coat from the blanket on the next job.

The positioning of the applicator roller relative to the plate or blanket is repeatable to a predetermined preset operative position. Consequently, only minor printing unit modifications or alterations may be required for the LITHOFLEX™ process. Although automatic extension and retraction have been described in connection with the exemplary embodiment, extension to the operative (on-impression) position and retraction to a non-operative (off-impression) position can be carried out manually, if desired. In the manual embodiment, it is necessary to latch the inking/coating apparatus 10 to the press side frames 14, 15 in the operative (on-impression) position, and to mechanically prep the inking/coating apparatus in the off-impression (retracted) position.

Referring again to FIGURE 8, an applicator roller 66 is mounted on the lower cradle assembly 100 by side support members 78, 80, and a second applicator roller 66 is mounted on the upper cradle assembly 102 by side support members 82, 84. According to this arrangement, the inking/coating apparatus 10 can apply printing ink and/or coating material to a plate on the plate cylinder, while simultaneously applying printing ink and/or coating material to a plate or a blanket on the blanket cylinder of the same printing unit. When the same color ink is used by the upper and lower applicator rollers from the plate position and from the blanket position simultaneously on the same printing unit, a "double bump" or double inking films or coating layers are applied to the substrate S during a single pass of the substrate through the printing unit. The tack of the two inks or coating materials must be compatible for good transfer during the double bump. Moreover, the inking/coating apparatus 10 can be used for supplying ink

or coating material to the blanket cylinder of a rotary offset web press, or to the blanket of a dedicated coating unit.

According to conventional bronzing techniques, a metallic (bronze) powder is applied off-line to previously printed substrate which produces a grainy, textured finish or appearance. The on-line application of bronze material by conventional flexographic or lithographic printing will only produce a smooth, continuous appearance. However, a grainy, textured finish is preferred for highest quality printing which, prior to the present invention, could only be produced by off-line methods.

Referring now to FIGURE 14 and FIGURE 15, metallic ink or coating material is applied on-line to the substrate S by simultaneous operation of the upper and lower applicator rollers 67R, 66 to produce an uneven surface finish having a bronze-like textured or grainy appearance. According to the simulated bronzing method of the present invention, the flexographic bronze ink is applied simultaneously to the plate and to the blanket by the dual cradle inking/coating apparatus 10 as shown in FIGURE 14. A resilient applicator roller 67R is mounted in the upper cradle 102, and an anilox applicator roller 66 is mounted on the lower cradle 100. The rollers are supplied from separate doctor blade reservoirs 70. The doctor blade reservoir 70 in the upper cradle position supplies bronze ink or coating material having relatively coarse, metallic particles 140 dispersed in aqueous or flexographic ink. The coarse particle ink or coating material is applied to the plate P by the resilient applicator roller 67R in the upper cradle position 102. At the same time, flexographic and/or bronze ink or coating material having relatively fine, metallic particles 142 is transferred to the blanket B by the anilox roller 66 which is mounted on the lower cradle 100.

The metering surfaces of the upper and lower applicator rollers have different cell sizes and volumetric capacities which accommodate the coarse and fine metallic particles. For example, the anilox roller 111 mounted in the upper cradle position 102 which transfers the coarse metallic particles 140 preferably has a screen line count in the range of 100-300 lines per inch (39-118 lines per cm), and the metering surface of the anilox roller 66 mounted on the lower cradle 100 which transfers the relatively fine metallic particles 142 preferably has a screen line count in the range of 200-600 lines per inch (79-236 lines per cm).

After transfer from the plate to the blanket, the fine metallic particles 142 form a layer over the coarse metallic particles 140. As both bronze layers are offset onto the substrate S, the layer of fine metallic particles 142 is printed onto the substrate S with the top layer of coarse metallic particles 140 providing a textured, grainy appearance. The fine metallic particles 142 cover the substrate which would otherwise be visible in the gaps between the coarse metallic particles 140. The combination of the coarse particle layer over the fine particle layer thus provides a textured, bronzed-like finish and appearance.

Particulate materials other than metal can be used for producing a textured finish. For example, coarse and fine particles of metallized plastic (glitter), mica particles (pearlescent) and the like, can be substituted for the metallic particles for producing unlimited surface variations, appearances and effects. All of the particulate material, including the metallic particles, are preferably in solid, flat platelet form, and have a size dimension suitable for application by an anilox applicator roller. Other particulate or granular material, for example stone grit having irregular form and size, can be used to good advantage.

Solid metal particles in platelet form, which are good reflectors of light, are preferred for producing the bronzed-like appearance and effect. However, various textured finishes, which could have light-reflective properties, can be produced by using granular materials such as stone grit. Most commonly used metals include copper, zinc and aluminum. Other ductile metals can be used, if desired. Moreover, the coarse and fine particles need not be made of the same particulate material. Various effects and textured appearances can be produced by utilizing diverse particulate materials for the coarse particles and the fine particles, respectively. Further, either fine or coarse particle ink or coating material can be printed from the upper cradle position, and either fine or coarse particle ink or coating material can be printed from the lower cradle position, depending on the special or surface finish that is desired.

It will be appreciated that the last printing unit 28 can be configured for additional inking/coating capabilities which include lithographic, waterless, aqueous and flexographic processes. Various substrate surface effects (for example double bump or triple bump inking/coating or bronzing) can be performed on the last printing unit. For triple bump inking/coating, the last printing unit 28 is equipped with an auxiliary in-line inking or coating apparatus 97 as shown in FIGURE 3 and FIGURE 4. The in-line inking or coating apparatus 97 allows the application of yet another film of ink or a protective or decorative layer of coating material over any freshly printed or coated surface effects or special treatments, thereby producing a triple bump. The triple bump is achieved by applying a third film of ink or layer of coating material over the freshly printed or coated double bump simultaneously while the substrate is on the impression cylinder of the last printing unit.

When the in-line inking/coating apparatus 97 is installed, it is necessary to remove the SUPER BLUE® flexible covering from the delivery cylinder 42, and it is also necessary to modify or convert the delivery cylinder 42 for inking/coating service by mounting a plate or blanket B on the delivery cylinder 42, as shown in FIGURE 3 and FIGURE 4. Packing material is placed under the plate or blanket B, thereby packing the plate or blanket B at the correct packed-to-print radial clearance so that ink or coating material will be printed or coated onto the freshly printed substrate S as it transfers through the

nip between the plate or blanket B on the converted delivery cylinder 42 and the last impression cylinder 36. According to this arrangement, a freshly printed or coated substrate is overprinted or overcoated with a third film or layer of ink or coating material simultaneously while a second film or layer of ink or coating material is being overprinted or over-coated on the last impression cylinder 36.

The auxiliary inking/coating apparatus 97 and the converted or modified delivery cylinder 42 are mounted on the delivery drive shaft 43. The inking/coating apparatus 97 includes an applicator roller, preferably an anilox applicator roller 97A, for supplying ink or coating material to a plate or blanket B on the modified or converted delivery cylinder 42. The in-line inking/coating apparatus 97 and the modified or converted delivery cylinder 42 are preferably constructed as described in U.S. Patent 5,176,077 to Howard W. DeMoore (co-inventor and assignee), which is hereby incorporated by reference. The in-line inking/coating apparatus 97 is manufactured and sold by Printing Research, Inc. of Dallas, Texas, U.S.A., under its trademark SUPER BLUE E2 COATER™.

After the delivery cylinder 42 has been modified or converted for inking/coating service, and because of the reduced nip clearance imposed by the plate or blanket B, the modified delivery cylinder 42 can no longer perform its original function of guiding and transferring the freshly printed or coated substrate. Instead, the modified or converted delivery cylinder 42 functions as a part of the inking/coating apparatus 97 by printing or coating a third down film of ink or layer of coating material onto the freshly printed or coated substrate as it is simultaneously printed or coated on the last impression cylinder 36. Moreover, the mutual tack between the second down ink film or coating layer and the third down ink film or coating layer causes the overprinted or overcoated substrate to cling to the plate or blanket, thus opposing or resisting separation of the substrate from the plate or blanket.

To remedy this problem, a vacuum-assisted transfer apparatus 99 is mounted adjacent the modified or converted delivery cylinder 42 as shown in FIGURE 3 and FIGURE 4. Another purpose of the vacuum-assisted transfer apparatus 99 is to separate the freshly overprinted or overcoated triple bump substrate from the plate or blanket B as the substrate transfers through the nip. The vacuum-assisted transfer apparatus 99 produces a pressure differential across the freshly overprinted or overcoated substrate as it transfers through the nip, thus producing a separation force onto the substrate and providing a clean separation from the plate or blanket B.

The vacuum-assisted transfer apparatus 99 is preferably constructed as described in U.S. Patent Nos. 5,113,255; 5,127,329; 5,205,217; 5,228,391; 5,243,909; and 5,419,254, all to Howard W. DeMoore, co-inventor, which are incorporated herein by reference. The vacuum-assisted transfer apparatus 99 is manufactured and sold by Printing Research, Inc. of Dallas, Texas, U.S.A. under its trademark BACVAC™.

Although the present invention and its advantages have been described in detail, it should be understood that various changes, substitutions and alterations can be made herein without departing from the spirit and scope of the present invention as defined by the appended claims.

Claims

1. A rotary offset printing press of the type including first and second printing units, the first printing unit comprising:

   a plate cylinder having a flexographic printing plate mounted thereon;
   a blanket cylinder having a blanket disposed in ink or coating transfer engagement with the flexographic printing plate for receiving aqueous or flexographic printing ink or coating material from the flexographic printing plate;
   an impression cylinder disposed adjacent the blanket cylinder thereby forming a nip between the blanket and the impression cylinder whereby the aqueous or flexographic printing ink or coating material can be transferred from the blanket to a substrate as the substrate is transferred through the nip;
   inking/coating apparatus movably coupled to the printing unit for movement to an on-impression operative position and to an off-impression retracted position;
   the inking/coating apparatus including container means for containing a volume of aqueous or flexographic ink or coating material, and at least one applicator roller coupled to the container means for applying aqueous or flexographic ink or coating material to the flexographic printing plate or to the blanket when the inking/coating apparatus is in the on-impression operative position;
   the container means having a partition dam dividing the container means thereby defining a first container region and a second container region;
   the at least one applicator roller having first and second transfer surfaces and means separating the first and second transfer surfaces; and,
   the first and second transfer surfaces of the at least one applicator roller being disposed within the first and second container regions for rolling contact with aqueous or flexographic printing ink or coating material contained within the first and second container regions, respectively.

2. A rotary offset printing press as defined in claim 1, wherein:

said separating means is an annular seal element disposed on the applicator roller; and,

the partition element is disposed in sealing engagement against the annular seal element of the applicator roller.

3. A rotary offset printing press as defined in claim 1, wherein:

said container means is an open fountain pan;

said separating means is an annular groove intersecting the applicator roller thereby separating the first and second transfer surfaces; and,

the partition element is a separator plate mounted on the fountain pan between the first and second reservoir regions and disposed in the annular groove.

4. A rotary offset printing press as defined in claim 1, including sheet feeding means coupled to the first printing unit for consecutively feeding substrates in sheet form into the first printing unit.

5. A rotary offset printing press as defined in claim 1, including web feeding means coupled to the first printing unit for continuously feeding a substrate in continuous web form into the first printing unit.

6. A rotary offset printing press as defined in claim 1, wherein:

said container means is a fountain pan having first and second pan sections for containing first and second aqueous or flexographic inks or coating materials, respectively;

said applicator roller having first and second transfer surfaces and an annular groove separating said first and second transfer surfaces; and,

a pan roller having first and second transfer surfaces mounted for rotation in the first and second pan sections, respectively, for separately transferring aqueous or flexographic ink or coating material from the first and second pan sections to the first and second transfer surfaces of the applicator roller.

7. A rotary offset printing press as set forth in claim 1, wherein:

said container means is a sealed doctor blade head having first and second reservoir chambers, said partition dam being mounted on the doctor blade head and separating the first and second reservoir chambers;

the at least one applicator roller comprising an anilox transfer roller having first and second fluid metering transfer surfaces disposed for rolling contact with the aqueous or flexographic ink or coating material in the first and second reservoir chambers, respectively;

the separating means being a seal band formed on the applicator roller between the first and second transfer surfaces; and,

the partition dam being disposed in sealing engagement with the seal band in the coupled position.

8. A rotary offset printing press as defined in claim 1, wherein the inking/coating apparatus comprises:

first cradle means for supporting a first applicator roller for engagement with a plate or blanket when the inking/coating apparatus is in the operative position;

second cradle means for supporting a second applicator roller for engagement with a plate or blanket when the inking/coating apparatus is in the operative position;

a first applicator roller mounted for rotation on the first cradle means, the first applicator roller having first and second transfer surfaces and a seal band separating the first and second transfer surfaces;

a second applicator roller mounted for rotation on the second cradle means, the second applicator roller having first and second transfer surfaces and means separating the first and second transfer surfaces;

first reservoir means for containing a volume of ink or coating material, the first reservoir means having first and second reservoir chambers and a partition element separating the first and second reservoir chambers of the first reservior means;

second reservoir means for containing a volume of ink or coating material, the second reservoir means having first and second reservoir chambers and a partition element separating the first and second reservoir chambers of the second reservoir means;

the first and second reservoir means being coupled to the first and second applicator rollers, respectively, the first and second transfer surfaces of the first applicator roller being disposed for rolling contact with ink or coating material in the first and second reservoir chambers, respectively, of the first reservoir means and the first partition seal element being disposed in sealing engagement against the separating means of the first applicator roller in the coupled position; and,

the first and second transfer surfaces of the second applicator roller being disposed for rolling contact with ink or coating material in the first and second reservoir chambers, respectively, of the second reservoir means and the partition element of the second reservoir means being disposed in sealing engagement with the separating means of the second applicator roller in the coupled position.

9. A rotary offset printing press as defined in claim 1, wherein:

the at least one applicator roller is an anilox roller having first and second fluid metering transfer surfaces; and,

the volumetric capacity of the first transfer surface being different from the volumetric capacity of the second transfer surface.

10. A rotary offset printing press as defined in claim 1, wherein the inking/coating apparatus comprises:

cradle means;
the at least one applicator roller being mounted for rotation on the cradle means, the applicator roller having first and second transfer surfaces and means separating the first and second metering transfer surfaces;
reservoir means for containing a volume of ink or coating material, the reservoir means having first and second reservoir chambers and a partition element separating the first and second reservoir chambers;
the at least one applicator roller being coupled to the reservoir means with the first and second fluid metering transfer surfaces being disposed for rolling contact with the ink or coating material in the first and second reservoir chambers, respectively, and the partition element being disposed in sealing engagement with separating means of the applicator roller in the coupled position; and,
the volumetric capacity of the first transfer surface being different from the volumetric capacity of the second transfer surface.

11. A rotary offset printing press as set forth in claim 1, wherein the inking/coating apparatus comprises:

a fountain pan for containing a volume of liquid ink or coating material;
an applicator roller having a metering surface; and,
a pan roller mounted for rotation in the fountain pan and coupled to the applicator roller for transferring ink or coating material from the fountain pan to the applicator roller.

12. A rotary offset printing press as defined in claim 1, further including:

a transfer drum coupled in substrate transfer relation with the impression cylinder of the first printing unit and in substrate transfer relation with the second printing unit;
a first dryer mounted adjacent the impression cylinder of the first printing unit for discharging heated air onto a freshly printed or coated substrate while the substrate is in contact with the impression cylinder of the first printing unit;
a second dryer mounted adjacent the transfer drum for discharging heated air onto a freshly printed or coated substrate after it has been transferred from the impression cylinder of the first printing unit and while it is in contact with the transfer cylinder; and,
a third dryer disposed adjacent the second printing unit for discharging heated air onto a freshly printed or coated substrate after it has been transferred from the transfer drum and before it is printed or otherwise processed on the second printing unit.

13. A rotary offset printing press as defined in claim 1, wherein the means for applying ink or coating material comprises:

first cradle means;
a first reservoir or fountain means mounted on the first cradle means for containing ink or coating material;
a first applicator roller mounted for rotation on the first cradle means and disposed for rolling contact with ink or coating material in the first reservoir or fountain means, the first applicator roller being engagable with a printing plate on the plate cylinder;
second cradle means;
a second reservoir or fountain means mounted on the second cradle means for receiving ink or coating material; and,
a second applicator roller mounted for rotation on the second cradle means and disposed for rolling contact with ink or coating material in the second reservoir or fountain means, the second applicator roller being engagable with a plate or blanket mounted on the blanket cylinder in the operative position.

14. A rotary offset printing press as defined in claim 1, wherein the inking/coating apparatus is pivotally mounted on the printing unit in a position in which the nip contact point between said at least one applicator roller and a blanket or plate is offset with respect to a radius line projecting through the center of the plate cylinder or blanket cylinder to the axis of rotation of the printing/coating unit.

15. A rotary offset printing press as defined in claim 1, wherein:

said at least one applicator roller having first and second transfer surfaces and a seal band surface disposed between and separating the first and second transfer surfaces;

the reservoir means having a chamber and a partition member disposed within the chamber, the partition member dividing the chamber thereby defining a first reservoir chamber region and a sec-

ond reservoir chamber region; and,
the partition member surface being disposed in sealing engagement against the seal band of the applicator roller.

16. A rotary offset printing press as defined in claim 1, wherein the inking/coating apparatus comprises:

first cradle means for supporting a first applicator roller for engagement with a plate or blanket when the inking/coating apparatus is in the operative position;
second cradle means for supporting a second applicator roller for engagement with a plate or blanket when the inking/coating apparatus is in the operative position;
a first applicator roller mounted for rotation on the first cradle means, the first applicator roller having first and second fluid metering transfer surfaces and a separation band separating the first and second fluid metering transfer surfaces;
a second applicator roller mounted for rotation on the second cradle means, the second applicator roller having first and second fluid metering transfer surfaces and a separation band separating the first and second metering transfer surfaces;
first reservoir means for containing a volume of ink or coating material, the first reservoir means having first and second reservoir chambers and a first partition element separating the first and second reservoir chambers;
second reservoir means for containing a volume of ink or coating material, the second reservoir means having first and second reservoir chambers and a second partition seal element separating the first and second reservoir chambers of the second reservoir means;
the first and second fluid metering transfer surfaces of the first applicator roller being disposed for rolling contact with ink or coating material in the first and second reservoir chambers, respectively, of the first reservoir means and the first partition element being disposed in sealing engagement against the separation band of the first applicator roller in the coupled position; and,
the first and second fluid metering transfer surfaces of the second applicator roller being disposed for rolling contact with ink or coating material in the first and second reservoir chambers, respectively, of the second reservoir means and the second partition element of the second reservoir means being disposed in sealing engagement with the separation band of the second applicator roller in the coupled position.

17. A printing press as defined in claim 1, wherein the inking/coating apparatus comprises:

first cradle means for supporting a first applicator roller for engagement with a plate or blanket when the inking/coating apparatus is in the operative position;
second cradle means for supporting a second applicator roller for engagement with a plate or blanket when the inking/coating apparatus is in the operative position;
first reservoir means mounted on the first cradle means, said first reservoir means having a reservoir chamber for containing a volume of ink or coating material;
second reservoir means mounted on the second cradle means, said second reservoir means having a reservoir chamber for containing a volume of ink or coating material;
a first applicator roller mounted for rotation on the first cradle means, the first applicator roller having a fluid metering transfer surface;
a second applicator roller mounted for rotation on the second cradle means, the second applicator roller having a fluid metering transfer surface;
the first and second applicator rollers being coupled to the first and second reservoir means, respectively, the fluid metering transfer surfaces of the first and second applicator rollers being disposed for rolling contact with ink or coating material in the reservoir chambers of the first and second reservoir means, respectively; and,
the volumetric capacity of the fluid metering surface of the first applicator roller being different from the volumetric capacity of the fluid metering surface of the second applicator roller.

18. A printing press as defined in claim 1, wherein the means for applying ink or coating material comprises:

cradle means;
an applicator roller mounted for rotation on the cradle means, the applicator roller having first and second surfaces and a seal band separating the first and second transfer surfaces;
reservoir means for containing a volume of ink or coating material, the reservoir means having first and second reservoir chambers and a partition element separating the first and second reservoir chambers;
the applicator roller being coupled to the reservoir means with the first and second transfer surfaces being disposed for rolling contact with the ink or coating material in the first and second reservoir chambers, respectively, and the

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partition element being disposed in sealing engagement against the seal band of the applicator roller in the coupled position; and,
the volumetric capacity of the first fluid metering transfer surface being different from the volumetric capacity of the second fluid metering transfer surface.

19. A rotary offset printing press as defined in claim 1, further including:

a supply container for containing a volume of liquid ink or coating material;
circulation means coupled between the supply reservoir and the inking/coating apparatus for inducing the flow of liquid ink or coating material from said supply container to the inking/coating apparatus and for returning liquid ink or coating material from the inking/coating apparatus to the supply container; and,
heat exchanger means coupled to the circulation means for maintaining the temperature of the liquid ink or coating material within a predetermined temperature range.

20. A printing press as defined in claim 1, wherein the inking/coating apparatus is pivotally mounted on the first printing unit in a position in which the nip contact point between the applicator roller and a blanket or plate is offset with respect to a radius line projecting through the center of the plate cylinder or blanket cylinder to the axis of rotation of the printing/coating unit.

21. A printing press as defined in claim 1, including:

a dryer mounted on the first printing unit for discharging heated air onto a freshly printed or coated substrate before the freshly printed or coated substrate is subsequently printed, coated or otherwise processed on the second printing unit.

22. A printing press as defined in claim 21, wherein:

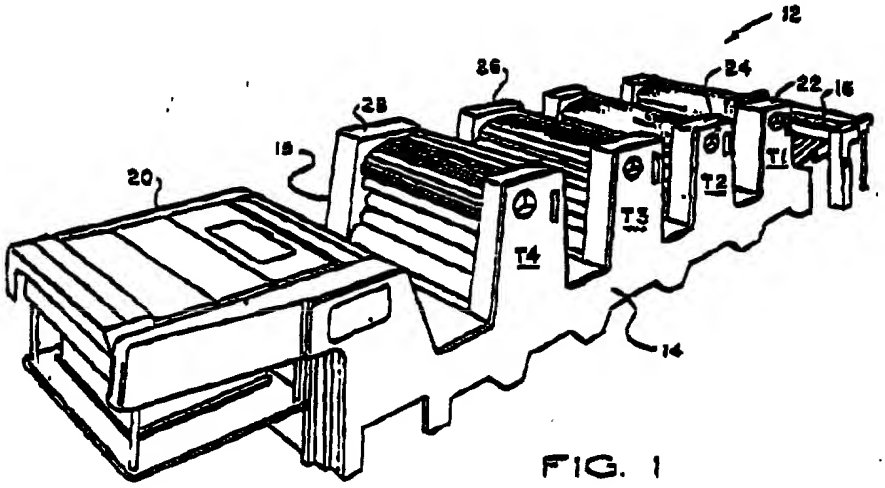
the dryer is mounted adjacent the impression cylinder of the first printing unit for discharging heated air onto a freshly printed or coated substrate while the substrate is in contact with said impression cylinder.

23. A printing press as defined in claim 1, further including:

a substrate transfer apparatus disposed in an interunit position on the press and coupled in substrate transfer relation with the impression cylinder of the first printing unit;
an interunit dryer disposed adjacent the substrate transfer apparatus for discharging heated air onto a freshly printed or coated substrate after it has been transferred from the first printing unit and while it is in contact with the substrate transfer apparatus.

24. A printing press as defined in claim 1, comprising:

a dryer mounted on the first printing unit for discharging heated air onto a freshly printed or coated substrate; and,
an extractor coupled to the dryer for extracting hot air and moisture vapors from an exposure zone between the dryer and the freshly printed or coated substrate.


12
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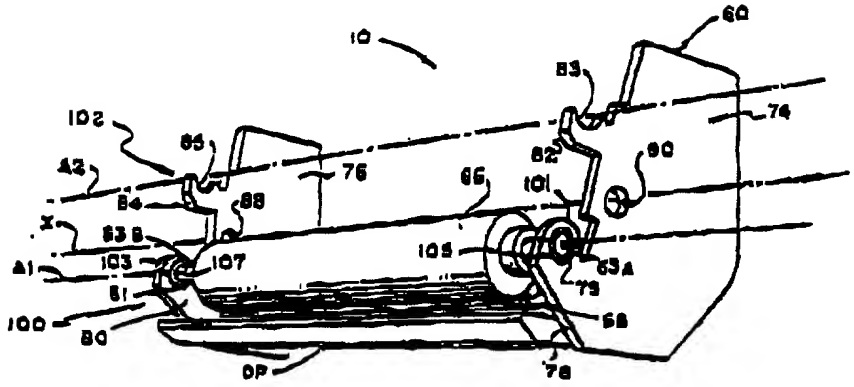
T1
T2
T3
T4
14

FIG. 1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84
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63A
79
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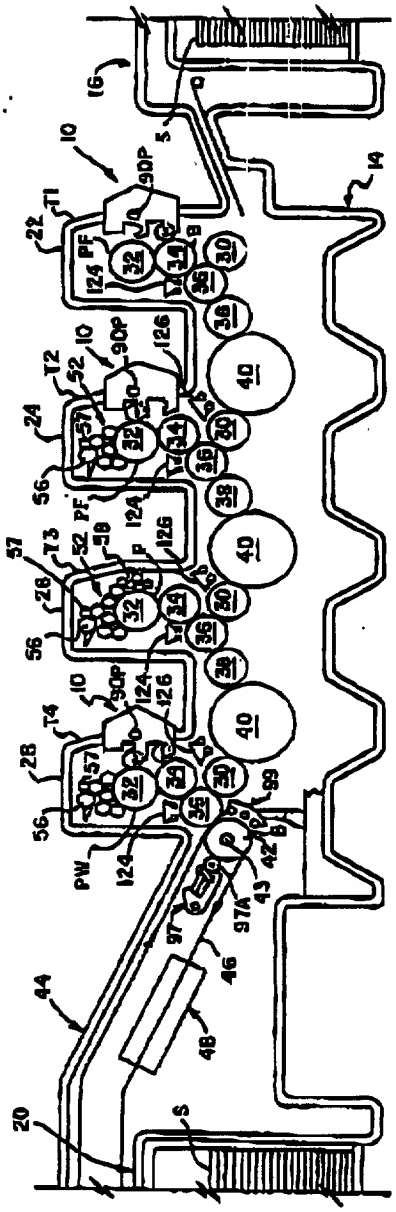
DP
78

FIG. 2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90P
T1
22
PF
124
32
34
30
36
38
40
126
T2
52
24
57
56
T3
26
T4
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PW
42
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97A
97
46
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44
20
S
14

FIG. 3

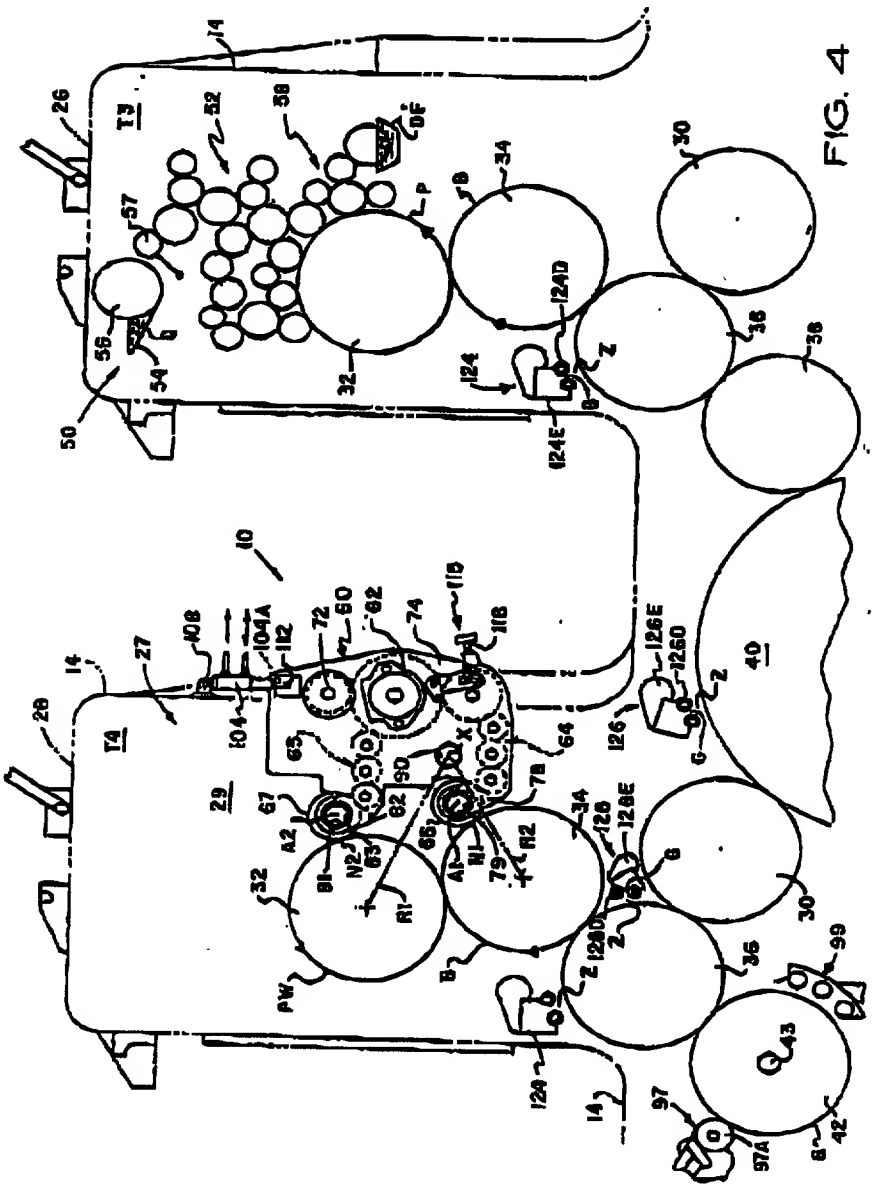

FIG. 4

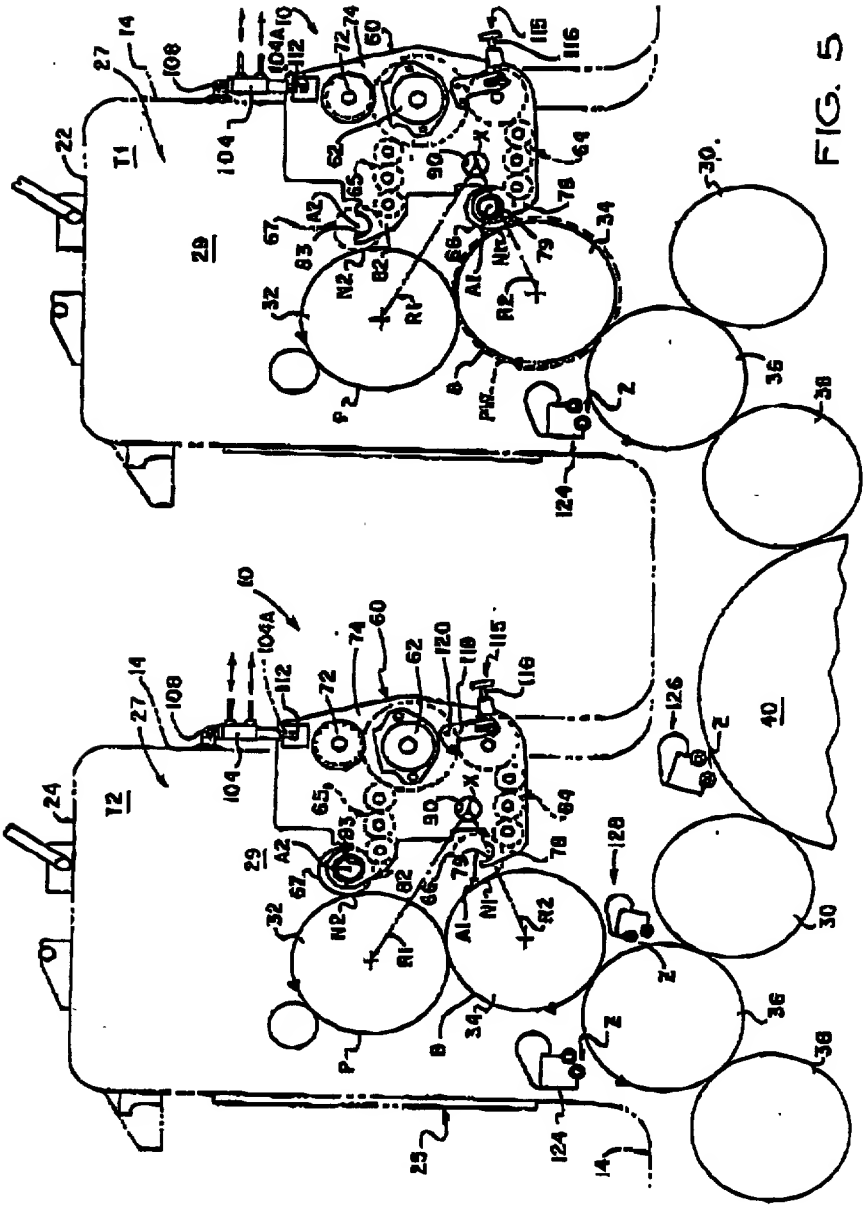

FIG. 5

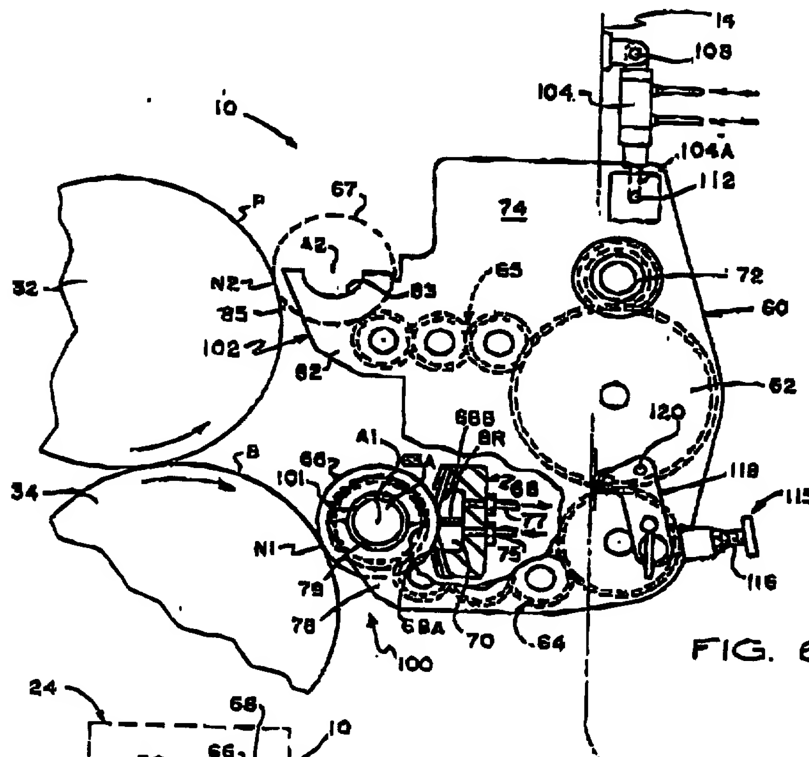

FIG. 6

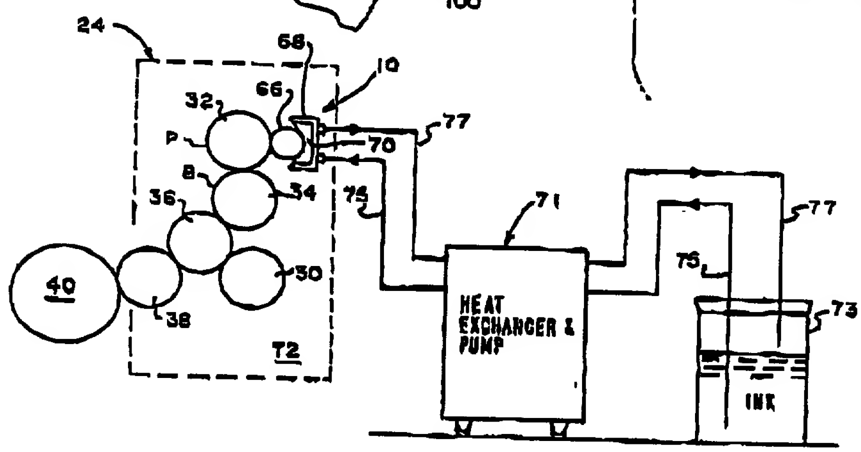

FIG. 7

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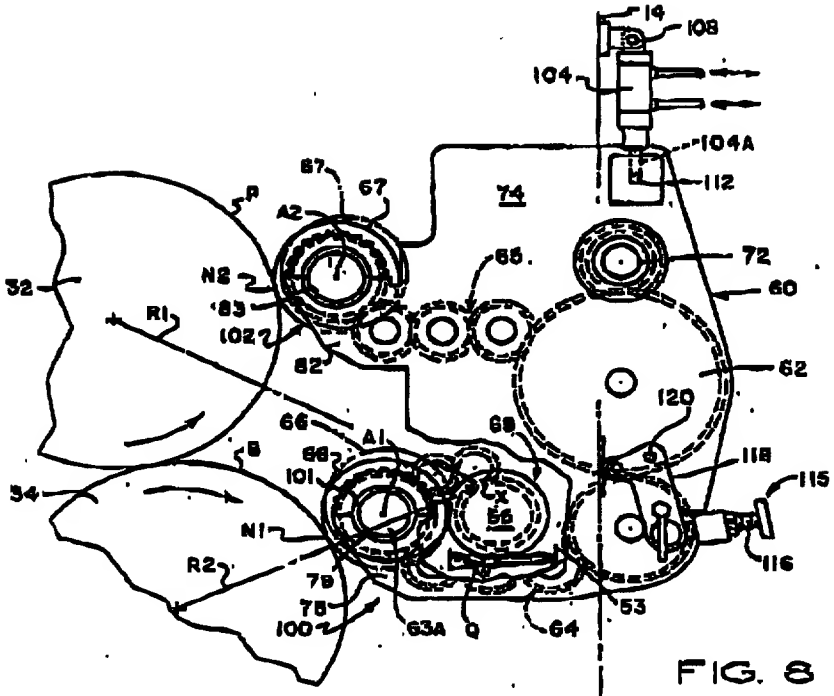
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67
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32
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R1
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82
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A1
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118
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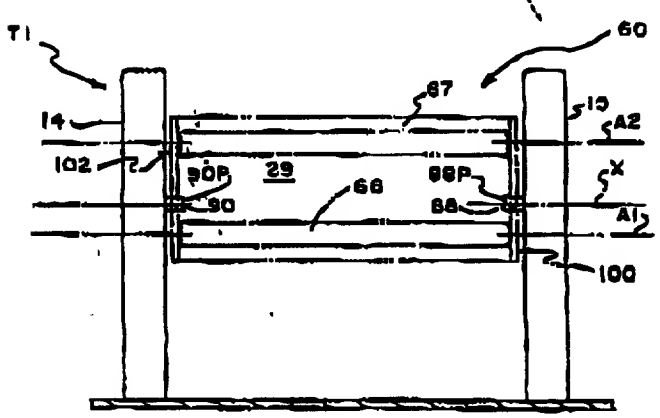
54
101
56
N1
116
R2
78
75
53
100
63A
Q
64

FIG. 8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A1
100

FIG. 9

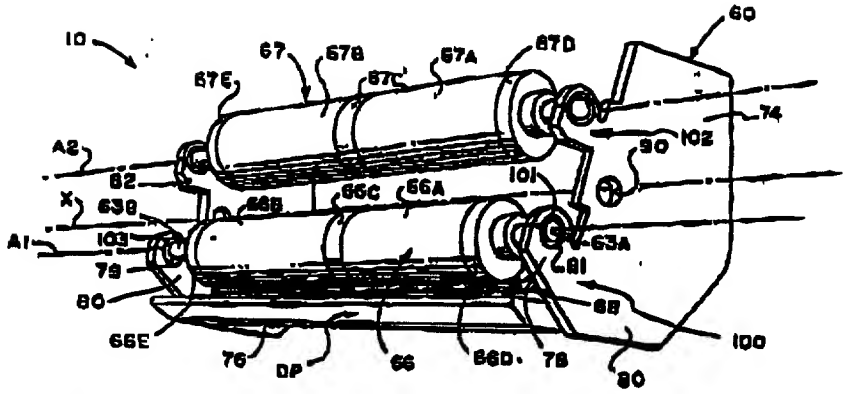


FIG. 10

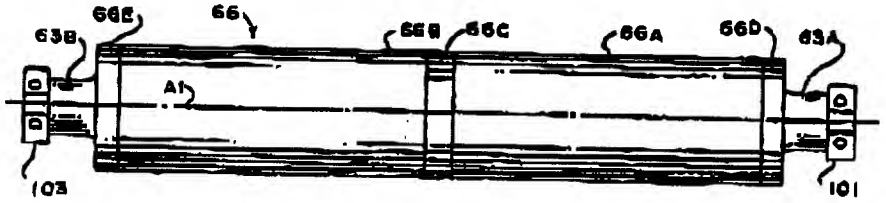


FIG. 11

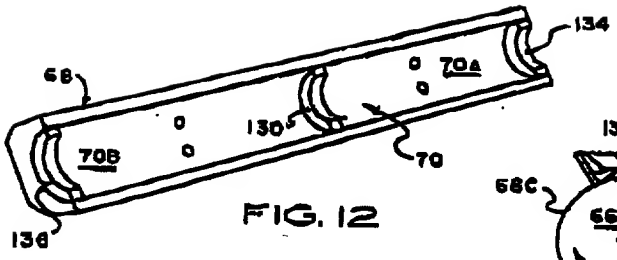


FIG. 12

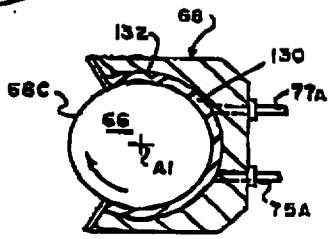
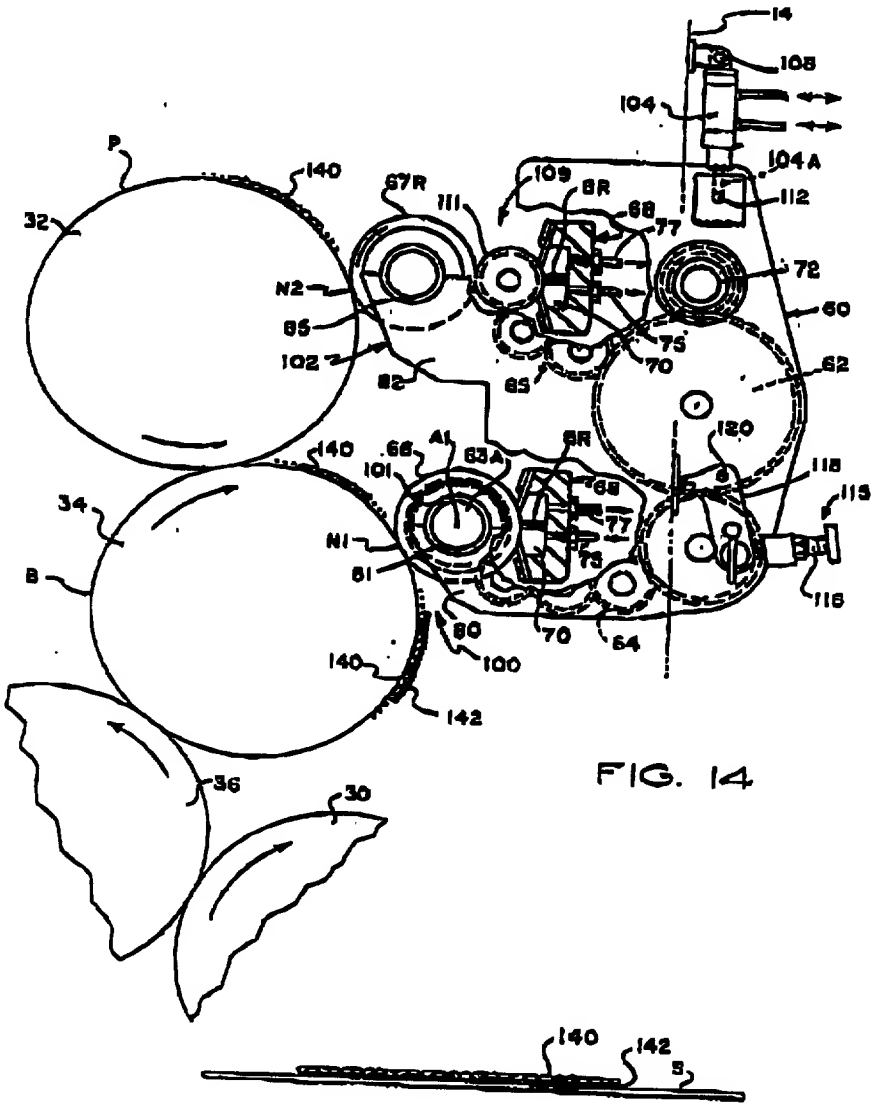


FIG. 13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108
104
104A
112
109
111
67R
68R
68
77
72
60
62
75
70
65
82
102
N2
85
32
P
140
34
B
N1
81
101
66
A1
63A
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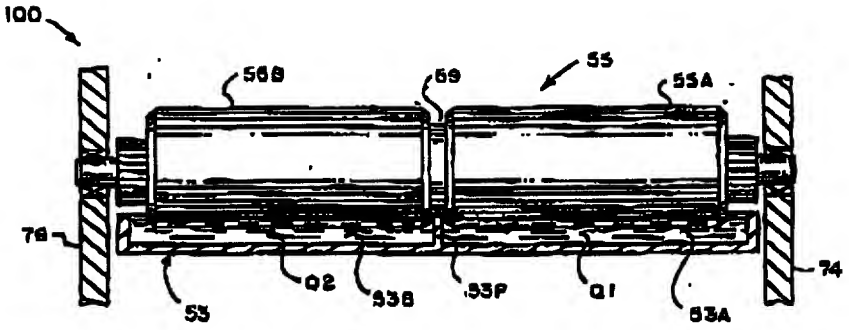
FIG. 14

FIG. 15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56B
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55A
76
74
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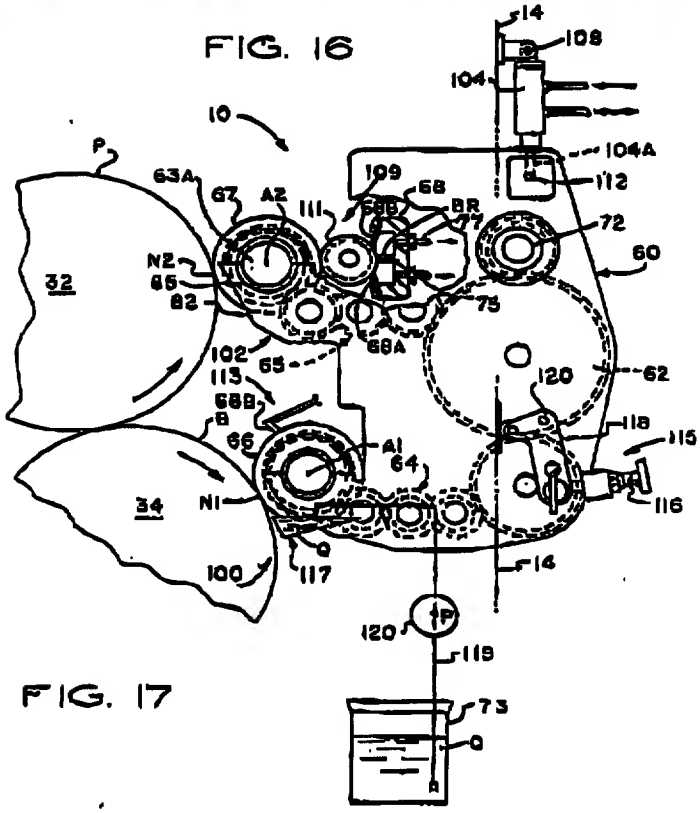
Q2
53B
53P
Q1
53A

FIG. 16


14
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104
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112
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A1
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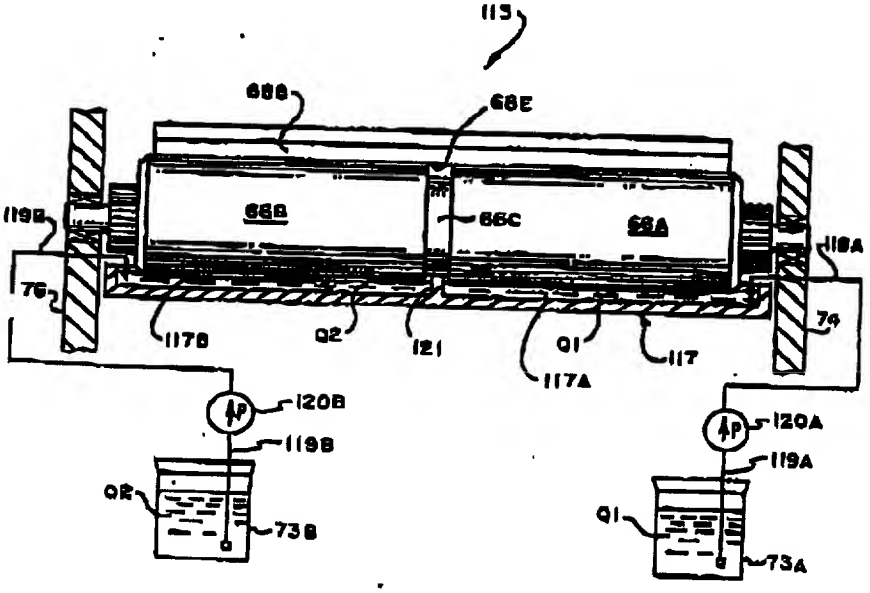
118
73
Q

FIG. 17


115
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Q1
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117A
120B
120A
119B
119A
Q2
Q1
73B
73A

FIG. 18

17

United States Patent [19]

Jahn

[11] **Patent Number: 4,615,293**

[45] **Date of Patent: Oct. 7, 1986**

[54] **MEDIUM-APPLYING DEVICE IN A PRINTING MACHINE**

[75] Inventor: **Hans-Georg Jahn**, Wiesenbach, Fed. Rep. of Germany

[73] Assignee: **Heidelberger Druckmaschinen AG**, Heidelberg, Fed. Rep. of Germany

[21] Appl. No.: **636,916**

[22] Filed: **Aug. 2, 1984**

[30] **Foreign Application Priority Data**

Aug. 3, 1983 [DE] Fed. Rep. of Germany 3327993

[51] **Int. Cl.**[4] **B05C 1/02**; B05C 11/10

[52] **U.S. Cl.** **118/46**; 118/212; 118/221; 118/249; 118/255; 118/262

[58] **Field of Search** 118/46, 221, 222, 255, 118/262, 212, 249

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,931,791	1/1976	Preuss et al.	118/236
4,399,767	8/1983	Simeth	118/46
4,446,814	5/1984	Abendroth et al.	118/46 X

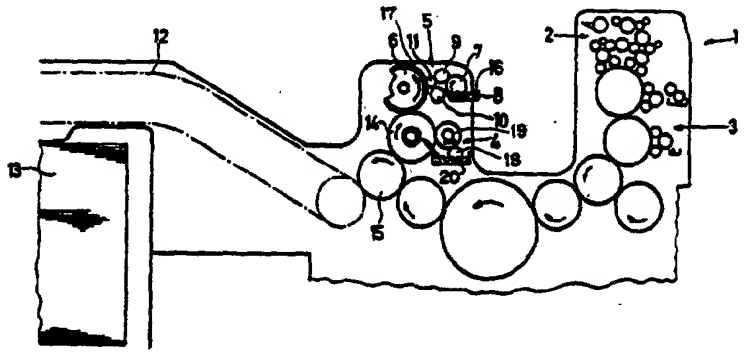
Primary Examiner—Evan K. Lawrence

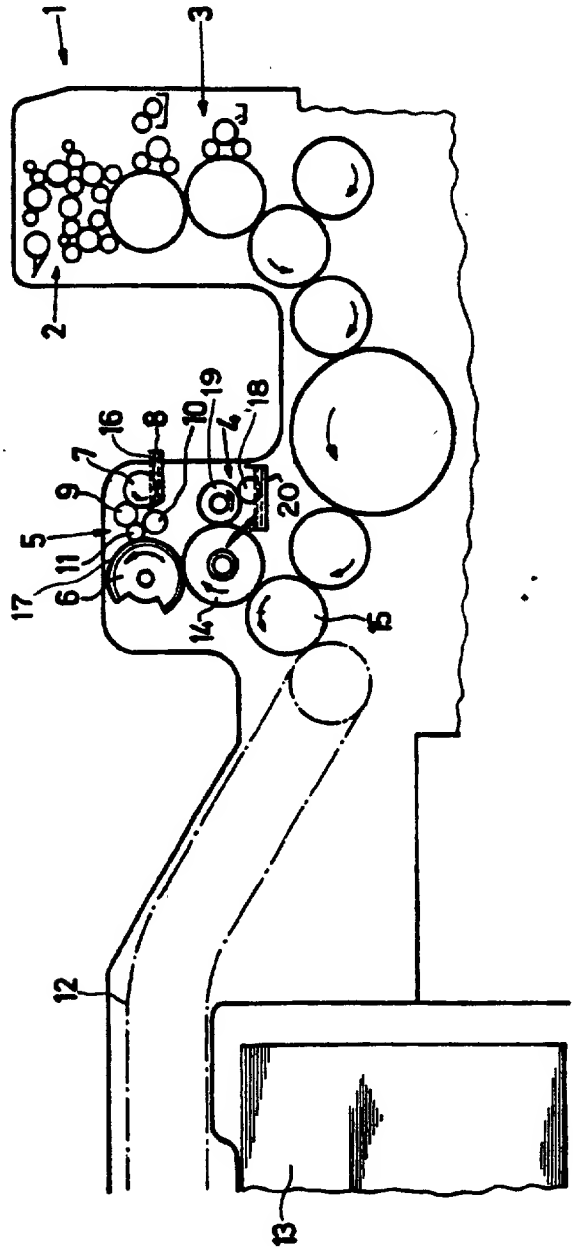
Attorney, Agent, or Firm—Herbert L. Lerner; Laurence A. Greenberg

[57] **ABSTRACT**

In a printing machine, a medium applicator disposed downstream of printing units of the machine, in travel direction through the machine of a sheet being printed, the medium applicator having an assembly formed of a first roller for taking up medium from a supply container, a second roller for metering a quantity of the medium to be applied, and a third roller for transferring the medium, the third roller having a continuous cylindrical surface with a rubber lining disposed thereon for directly applying the medium onto the sheet, the three rollers being in constant meshing engagement with a sheet-transfer cylinder during application of the medium, the medium applicator further comprising a plate cylinder having a cylindrical surface interrupted by a transverse channel and carrying a flexible relief plate having raised surfaces thereon, and another assembly of rollers for supplying medium from another supply container to the raised surfaces of the flexible relief plate, the plate cylinder being in operative engagement with the third roller.

3 Claims, 1 Drawing Figure

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MEDIUM-APPLYING DEVICE IN A PRINTING MACHINE

The invention relates to a medium applicator in a printing machine and, more particularly, to such a medium applicator which is disposed downstream of printing units of a printing machine, as viewed in travel direction through the machine of a sheet being printed therein, the medium applicator having an assembly formed of a first roller for taking up medium from a supply container, a second roller for metering a quantity of the medium to be applied, and a third roller for transferring the medium, the third roller having a continuous cylindrical surface with a rubber lining disposed thereon for directly applying the medium onto the sheet, the three rollers being in constant meshing engagement with a sheet-transfer cylinder during application of the medium. A medium applicator of this general type has been described in my commonly owned co-pending application Ser. No. 626,732 filed July 2, 1984, now abandoned.

A lacquering or varnishing device in printing machines has become known heretofore from German Published Non-Prosecuted Application No. (DE-OS) 30 46 257. This device includes a lacquer storage tank or supply container and a scooping roller dipping into this tank. The lacquer taken up by the scooping roller is fed in metered fashion to an applicator roller. Two doctor rollers, by means of which a format-related lacquer feed occurs, can be set close to the scooping roller. A ductor blade applicable against the metering roller is also provided. This ductor blade serves to wipe superfluous lacquer from the metering roller and to return it to the supply container.

A specific disadvantage of this heretofore known device is that the lacquer is fed to the varnishing or lacquering cylinder via a distributor roller and an application roller. Because of the relatively long transport distance which the lacquer has to cover over many rollers until it reaches the printed sheet, the lacquer begins to set i.e. no quick-drying lacquers can be used. Due to this limitation to slowly drying lacquers, when the sheet is delivered the reverse side or back of the next following sheet will smear the lacquer and thus paste the sheets together. Consequently, no full sheet piles can be set up, because the pile weight which is built up at the delivery end and which applies a load to the individual sheets also limits the lacquer layer thickness.

In the device described in German Pat. No. 23 45 183 for applying a medium there are provided a dipping roller, a metering roller, an applicator roller, a back-pressure cylinder, a form cylinder and another applicator roller. The two applicator rollers, the dipping roller and the metering roller are combined into a common structural unit. Within this structural unit, either the dipping roller with the form cylinder or the first applicator roller with the form cylinder or the second applicator roller with the back-pressure cylinder can cooperate.

A disadvantage of this last-mentioned construction is that the lacquer must first be fed to the printed material via the form cylinder. The platen mounted on the clamping device at the form cylinder forms a channel in which the lacquer accumulates after a given operating time. This lacquer-accumulation results in an irregular lacquer application due to dripping of the lacquer down onto the printed material.

German Pat. No. 20 20 584 is based upon a device for avoiding smearing of the ink due to lacquering. By means of a lacquering unit, the lacquer is applied to a printing-unit cylinder. This printing-unit cylinder, which has the same diameter as that of the cylinders of the preceding printing units, transfers the lacquer to the printed material. The disadvantages referred to hereinbefore are also applicable to this construction and require additionally, time-consuming cleaning work to be performed on the rollers. Moreover, the construction of the printing unit is complicated by having to attach the lacquering unit to the rubber of blanket cylinder.

A further disadvantage of the state of art as exemplified by the references cited hereinbefore, is that, due to the directions of rotation of the rollers, the format-related wiping by the ductor blade cannot be observed, thus making impossible a precise wiping or removal of the superfluous lacquer material.

It is an object of the invention of the instant application to provided a further improvement over the construction in my aforementioned co-pending application in the form of a supplemental medium-applying device which is suitable especially for coating or lacquering surfaces which are interrupted or spaced from one another and, furthermore, to provide a supplementary medium applicator or lacquering unit for applying coatings or for lacquering with layers of any selected thickness.

With the foregoing and other objects in view, there is provided, in accordance with the invention, in a printing machine, a medium-applicator disposed downstream of printing units of the machine, in the travel direction through the machine of a sheet being printed, the medium applicator having an assembly formed of a first roller for taking up medium from a supply container, a second roller for metering a quantity of the medium to be applied, and a third roller for transferring the medium, the third roller having a continuous cylindrical surface with a rubber lining disposed thereon for directly applying the medium onto the sheet, the three rollers being in constant meshing engagement with a sheet-transfer cylinder during application of the medium, the medium applicator further comprising a plate cylinder having a cylindrical surface interrupted by a transverse channel and carrying a flexible relief plate having raised surfaces thereon, and another assembly of rollers for supplying medium from another supply container to the raised surfaces of the flexible relief plate, the plate cylinder being in operative engagement with the third roller.

In this lacquering device or medium application, it is possible to apply medium or lacquer by means of a flexible relief or letterpress plate which is disposed on a plate cylinder. Fields or sections of the most varied size and shape are provided on this relief plate in order to perform the desired application of medium or lacquering of areas which are interrupted or spaced from one another.

In accordance with a further feature of the invention, the first, second and third rollers and the medium supply container associated therewith form a first-medium applying device, and the plate cylinder, the other assembly of rollers and the other supply container form a supplementary medium-applying device, and means are included for operating the first medium-applying device simultaneously with the supplementary medium-applying device.

In accordance with an added feature of the invention, the medium is a lacquer.

Both medium-applying or lacquering devices are used simultaneously in order to attain a maximum coating thickness of the medium or lacquer at least at predetermined areas of the sheet.

Other features which are considered as characteristic for the invention are set forth in the appended claims.

Although the invention is illustrated and described herein as embodied in medium-applying device in a printing machine, it is nevertheless not intended to be limited to the details shown, since various modifications and structural changes may be made therein without departing from the spirit of the invention and within the scope and range of equivalents of the claims.

The construction and method of operation of the invention, however, together with additional objects and advantages thereof will be best understood from the following description of specific embodiments when read in connection with the accompanying single FIGURE of the drawing which is a diagrammatic elevational view of the printing machine having a first lacquering device and a doctor blade assembly arranged at an applicator roller and disposed in front of a delivery unit and, in accordance with the invention, having a supplementary lacquering device located above the first lacquering device.

Referring now to the FIGURE of the drawing, there is shown therein a last printing unit 1 of a printing machine having a conventional inking unit 2 and a conventional dampening unit 3. Following the last printing unit 1, in direction of feed of paper through the printing machine from the right-hand side to the left-hand side of the drawing FIGURE, is a duplex lacquering unit formed of a first lacquering device 4 and a supplementary lacquering device 5 disposed above the first lacquering device 4. Printed sheets are conveyed from the last printing unit 1 to the lacquering devices 4 and 5, respectively. After the consequent treatment or processing of the sheets by the lacquering devices 4 and 5, respectively, the sheets are conveyed further by a delivery chain 12 to a delivery pile 13.

The first lacquering device 4 includes a first roller 18 for taking up medium from a supply container 20, a second roller 19 for metering a quantity of the medium to be applied, and a third roller 14 for transferring the medium, the third roller having a continuous cylindrical surface with a rubber lining disposed thereon for directly applying the medium onto the sheet which is to be processed.

The supplementary lacquering device 5 disposed above the first lacquering device 4 is made up of a lacquer supply vessel or tank 8 wherein a dipping roller 7 rotates, and transfers lacquer successively to a metering roller 9, a distributor roller 10 and an applicator roller 11. The applicator roller 11 is in direct contact with a plate cylinder 6 which is provided with a flexible relief or letterpress plate 17 used for lacquering. The plate cylinder 6 transfers the lacquer applied thereto to the roller 14 which, in turn, is in contact with the sheet-transfer cylinder 15. The sheet-transfer cylinder 15 has non-illustrated grippers which are sunk below the outer cylindrical surface thereof i.e. the back of the gripper is disposed lower than the surface of the sheet which is to be processed. After the consequent processing has been performed, the cylinder 15 surrenders the sheet to the delivery chain or conveyor 12 which then conveys it to the delivery pile 13.

Lacquer 16 is received in the supply tank 8 and serves for suitably treating or processing the sheet after it has been printed. During the rotation of the dipping roller 7, it picks up the lacquer 16 from the supply tank 8 and transfers the lacquer 16 to the metering roller 9. The applicator roller 11 disposed in contact with the metering roller 9 transfers the lacquer 16 to the relief or letterpress plate on the plate cylinder 6 which is formed with suitable recesses. The distributor roller 10 distributes the lacquer uniformly in lacquering regions provided on the applicator roller 11. The format-dependent lacquering operation is effected by means of non-illustrated conventional doctor-blade devices which are attachable to the metering roller 9.

The relief or letterpress plate disposed on the plate cylinder 6 is suitably furnished with surfaces required for the lacquering process. The lacquer 16 adheres to the raised surfaces of the relief plate and at these locations, is transferred to the roller 14. Further transfer of the lacquer is effected via the roller 14 directly to the sheet being printed which is located on the sheet-transfer cylinder 15.

With the foregoing embodiment of the invention, it is possible to provide non-illustrated means either to use the first lacquering unit 4 individually or, if specific breaks or discontinuities i.e. spacings, in the lacquer coating applied to the material being printed are required, to use the supplementary device 5 individually or, if special coating thicknesses of the lacquer is required, to use the duplex lacquering unit, namely both the first lacquering device 4 and the supplementary lacquering device 5 simultaneously.

There are claimed:

1. In a printing machine, a medium applicator disposed downstream of printing units of the machine, in the travel direction through the machine of a sheet being printed, the medium applicator having an assembly formed of a first roller for taking up medium from a supply container, a second roller for metering a quantity of the medium to be applied, and a third roller for transferring the medium, the third roller having a continuous cylindrical surface with a rubber lining disposed thereon for directly applying the medium onto the sheet, the three rollers being in constant meshing engagement with a sheet-transfer cylinder during application of the medium, the medium applicator further comprising a plate cylinder having a cylindrical surface and carrying a flexible relief plate having raised surfaces thereon, and another assembly of rollers for supplying medium from another supply container to said raised surfaces of said flexible relief plate, said plate cylinder being in operative engagement with the third roller.

2. Medium applicator according to claim 1 wherein the first, second and third rollers and the medium supply container associated therewith form a first-medium applying device, and said plate cylinder, said another assembly of rollers and said another supply container form a supplementary medium applying device, and further including means for operating said first medium applying device simultaneously with said supplementary medium applying device.

3. medium applicator according to claim 1 wherein the medium is a lacquer.

* * * * *

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(54) Geteilter Farbkasten für eine Flexodruckmaschine.

(57) Um einen Flexo-Farbkasten in axiale Zonen (10a, 10b, ...) unterteilen zu können, damit Druckfarben mit verschiedenen Eigenschaften, beispielsweise in verschiedenen Farben entlang der axialen Zonen einer Aniloxwalze (10) angewandt werden können, besitzt ein Trennelement (2) ein Einsatzstreifenelement (3), das sich über einen Teil des Umfangs der Aniloxwalze erstreckt und mit dieser, beispielsweise über zusammengedrückten Silikongummi (5), in elastischer Berührung steht. Angrenzend an die Enden des Streifenelements (5) befinden sich zwei Filzkissen (21, 31), die einen ringförmigen Trennflüssigkeitsfilm auf die Aniloxwalze aufbringen. An einer Trogstruktur sind zwei Rakeln angebracht, die abhängig von der Drehrichtung der Aniloxwalze selektiv von ihrer Anlage an der Oberfläche der Aniloxwalze abgehoben werden können. Außerdem können die Rakeln beide von der Oberfläche der Aniloxwalze abgehoben werden.

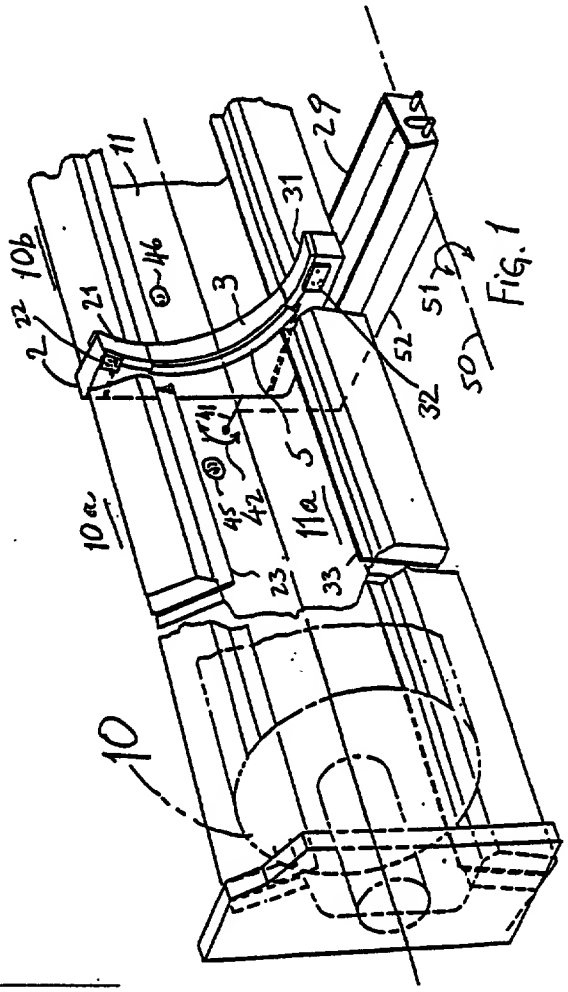

Fig. 1

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"GETEILTER FARBKASTEN FÜR EINE FLEXODRUCKMASCHINE"

Die vorliegende Erfindung bezieht sich auf Druckmaschinen, im besonderen auf Flexodruckmaschinen, und speziell auf ein Farbsystem oder einen Farbkasten für solche, wobei der Farbakasten axial in verschiedene Zonen unterteilt ist, um zu ermöglichen, in den betreffenden Zonen verschiedenfarbige Druckfarben für die entsprechenden Zonen einer Auftrag- oder Aniloxwalze zu verwenden.

Technologischer Hintergrund:

Flexodruckmaschinen werden auf dem Gebiet des Druckereiwesens in zunehmendem Maße benutzt. Üblicherweise verwendet man Flexodruckmaschinen zum Bedrucken von Beuteln, Verpackungsmaterialien, Kartonnagen und Schachteln. In neuerer Zeit wird der Flexodruck außerhalb des Verpackungsbereichs angewandt, hauptsächlich für Bücher, Zeitschriften, Geschäftsdrucksachen und dergleichen. Eine gute Besprechung des Flexodrucks findet man in "Maschinendruck" (Machine Printing) von Durrant, Meacock und Whitworth, Copyright 1973 bei Hastings House Publishers, New York, N.Y.

Es ist schon früher vorgeschlagen worden, Druckfarben mit verschiedenen Merkmalen, beispielsweise in verschiedenen Farben, hinsichtlich konkreter Zonen auf einer Farbduktorwalze zu trennen, an der mindestens eine oder üblicherweise zwei Rakeln angreifen, siehe z.B. die U.S.-Anmeldung, Serialnummer 921.338, eingereicht am 21. Oktober 1986, von Batke und anderen. Diese Anmeldung bezieht sich auf ein System, in dem unter einer sich axial erstreckenden Rakel eine Trennplatte angeordnet ist. Die Trennplatte besitzt, an dieser befestigt, ein Abdichtelement, das elastisch an der Unterseite zweier dem Duktor oder der Trogwalze aus verschiedenen Richtungen gegenüberstehenden Rakeln angreift, die den Betrieb des Duktors oder der Trogwalze in beiden Drehrichtungen ermöglichen. An der Kante, welche an den Rakeln anliegt, ist eine reibungsarme Oberfläche angebracht, wobei das abdichtende Element den Raum zwischen den Rakeln überbrückt und das Element mit dem Umfang des Duktors oder der Trogwalze zusammengepaßt ist. Die Rakeln erstrecken sich axial über die Abdichtelemente hinaus. Die Trennplatten und die Abdichtelemente können an Einheiten montiert werden, die effektiv entlang dem Farbkasten und somit entlang dem Duktor oder der Trogwalze angeordnet sind, und zwar in so gewählten Positionen, wie es die axiale Erstreckung der verschiedenfarbigen Druckfarbenzonen erfordert.

Die deutsche Patent-Offenlegungsurkunde DE-OS 23 20 638, auf die in der vorerwähnten Patentanmeldung von Batke Bezug genommen wird, beschreibt eine Anordnung, bei der zwei die Druckfarben trennende Blechelemente durch eine Federkraft direkt an den Umfang eines Duktors angestellt werden, um verschiedenfarbige Druckfarben voneinander zu trennen. Die Querabdichtung des Druckfarbenbehälters oder Farbsumpfs wird hergestellt, indem man die Trennelemente gegen die gegenüberliegende Oberfläche der Rakeln oder Abstreifmesser anstellt.

Die Erfindung:

Sie hat zur Aufgabe , eine flexible Einrichtung zum Trennen axialer Zonen auf einer Aniloxwalze für eine Flexo-Druckmaschine zu schaffen, so daß Druckfarben mit verschiedenen Merkmalen, beispielsweise in verschiedenen Farben, ohne Überlappung auf die betreffenden Zonen aufgebracht werden können, wobei die Einrichtung einfach und kostengünstig ist und für eine wirksame Abdichtung der axialen Zonen gegeneinander sorgt.

Kurz gesagt, ein trennendes Streifenelement, vorzugsweise mit einer reibungsarmen Oberfläche, hat eine gekrümmte Fläche, die gegenüber der Oberfläche der Aniloxwalze angebracht ist und mit dieser zusammenpaßt. Die gekrümmte Fläche erstreckt sich über einen Teil des Walzenumfangs. Um die Druckfarben mit verschiedenen Eigenschaften eindeutig zu trennen und so eine Wanderung der Farbe zwischen den beiden oder mehreren Druckfarbenzonen zu verhindern und den Abriebeffekt der auf Wasserbasis hergestellten Druckfarben zu eliminieren, wird zwischen das Streifenelement und die Oberfläche der Aniloxwalze ein dünner Film einer wässerigen Flüssigkeit eingebracht. Typisch ist das Streifenelement aus Teflon hergestellt, und die Flüssigkeit ist Wasser. Andere Flüssigkeiten, wie Wasser-Alkoholgemische oder Druckfarben-Lösungsmittel können benutzt werden. Der Flüssigkeitsfilm wird in den Bereich unter dem Streifen so eingebracht, daß zwei mit Flüssigkeit tränkbare Elemente neben den Enden des Streifenelements angebracht werden. Ein bevorzugtes Material ist Filz; andere schwammartige Werkstoffe können benutzt werden. Die Flüssigkeit wird den Filzelementen zugeführt, die als Dochte wirken und den dünnen Flüssigkeitsfilm genau in den Bereich des Trennstreifens einbringen.

In Übereinstimmung mit einer vorteilhaften Ausgestaltung der Erfindung ist das Streifenele-

ment rückseitig mit beispielsweise Silikongummi mit einem niedrigen Durometerwert hinterfüttert. Das ermöglicht der Dichtung, sich unabhängig von der Drehrichtung der Aniloxwalze selbsttätig einzustellen.

Aniloxwalzen werden üblicherweise mit Rakeln benutzt. Gemäß einer weiteren vorteilhafter Ausgestaltung der dem Erfindung werden die Rakeln beschnitten oder so ausgeführt, daß sie an den Trennelementen enden. Die Gummihinterfütterung ermöglicht das Abdichten der Rakelecken in den Druckfarbenkammern neben den Farben-Trennelementen und somit auch das wirkungsvolle Abdichten der Rakelkanten, und zwar durch das plastische Verformen des Silikongummis, d.h. durch das Vorwölben über die Kante bei Druckanwendung.

In Übereinstimmung mit einer weiteren vorteilhaften Ausgestaltung der Erfindung ist das Farbsystem so angeordnet, daß eine Haltestruktur für die Trennenden Streifenelemente, für die Gummihinterfütterung und für die Filzkissen oder, vorzugsweise, der ganze Farbkasten so bewegt werden können, daß wahlweise eine der beiden Rakeln mit der Aniloxwalze in Berührung steht, und zwar abhängig von der Drehrichtung der Aniloxwalze, und daß ferner die Bewegung so erfolgen kann, daß beide Rakeln die Aniloxwalze freigeben, während das Trennelement und, vorzugsweise, auch die Kissen mit der Oberfläche der Aniloxwalze in Berührung bleiben. Das hat den Vorteil, daß während der Perioden, in denen nicht gedruckt wird, die Aniloxwalze weiter rotieren kann, wobei die Farbe im Farbkasten umgewälzt und dadurch einem Antrocknen der Farbe an der Aniloxwalze vorgebeugt wird, jedoch ohne daß eine der Rakeln mit der Aniloxwalze in Berührung steht, wodurch die Abnutzung sowohl der Aniloxwalze als auch der betreffenden Rakel oder Rakeln wesentlich herabgesetzt wird.

ZEICHNUNGEN:

Abb. 1 ist eine perspektivische Gesamtansicht eines Flexo-Farbwerks (wobei die Aniloxwalze als Phantombild angedeutet ist), das Farbwerk ist gemäß der vorliegenden Erfindung axial aufgeteilt.

Abb. 2 ist ein schematischer Schnitt senkrecht zur Achse einer Aniloxwalze, in dem die Druckfarben-Trenneinrichtung gemäß der vorliegenden Erfindung dargestellt ist.

Eine Aniloxwalze 10 in Standardausführung mit beispielsweise etwa 28 cm (ungefähr 11") Durchmesser ist in axiale Zonen unterteilt, entsprechend den axialen Zonen 10a, 10b oder mehr, je nach den Erfordernissen des Farbkastens. Ein Trennelement 2, beispielsweise aus Kunststoff - wofür Nylon geeignet ist - ist in einem geeigneten Bauteil des Farbkastens, der nur schematisch durch 11 dargestellt ist, mit Schrauben 12 befestigt. Der Farbkasten 11, der einen Farbenhohlraum 11a definiert, ist in bekannter Weise am Maschinenrahmen befestigt. Er kann um eine zur Ebene der Abb. 2 senkrechte Achse 11b (Abb. 2) etwas pendeln. Das Trennelement ist schmal, und es erstreckt sich über einen Teil des Umfangs der Aniloxwalze 10. Das Trennelement 2 ist mit einer Ausnehmung 13 ausgeführt, in die eine Teflondichtung 3 eingesetzt ist, die rückseitig durch eine Hinterfütterung 5 aus Silikongummi gestützt wird. Bei Zeitungsdruck ist eine Breite der Elemente 3 und 5 von etwa 15 mm geeignet.

Das Silikongummi-Hinterfütterungselement 5 verteilt den Druck des Nylon-Trennstreifens 3 gleichmäßig über den Umfang der Aniloxwalze. Die zusammendrückende Kraft im Silikongummi kann durch Gegendrücken gegen die Aniloxwalze 10 erzeugt werden. Damit kann der Druck des Trennstreifens 3 gegen die Aniloxwalze gesteuert werden.

Erfindungsgemäß wird ein dünner Flüssigkeitsfilm - typisch ist Wasser - zwischen die Aniloxwalze 10 und den Teflon-Trennstreifen 3 gebracht. Dieser dünne Wasserfilm kommt von zwei Filzkissen 21, 31, die mit Wasser aus einem Wasserversorgungs-Leitungsnetz beliefert werden. Das Leitungssystem für die Wasserversorgung wird durch die Hohlschrauben 14a, 14b gebildet, die in das Trennelement eingeschraubt sind und mit Kanälen 15a, 15b in Verbindung stehen, die in dem Trennelement ausgebildet sind und an den Filzstreifen 21 bzw. 31 enden. Die Formen der Kanäle können jedem zweckdienlichen Erfordernis angepaßt werden, beispielsweise gerade, wie bei 15a dargestellt ist, oder abgewinkelt oder gekrümmt, wie bei 15b. Ein Wassertrog 29 unter der gesamten Anordnung nimmt einen eventuellen Wasserüberschuß oder das Tropfwasser auf.

Die Schrauben 14a, 14b haben Außengewinde, und man kann, obwohl das nicht erforderlich ist, Muttern 16a, 16b benutzen, um die Schrauben gegen den Rahmen 11 zu sichern. Die Schrauben 14a, 14b sind mittels einer geeigneten Flüssigkeits-Verschraubung 17a, 17b an eine schematisch dargestellte Druckwasser-Zuleitung angeschlossen, die solche allgemein übliche hydraulische Bauteile, wie Kniestücke, Überwurfmuttern und ähnl. sowie die Ventile 18a, 18b enthält. Das Wasser kann selektiv zu den jeweiligen Filzstreifen 21, 31 geleitet werden. Die Filzstreifen 21, 31 werden auf dem Trennelement 2 mit Hilfe der Halteplatten 22, 32, die die Filzstreifen 21, 31 von beiden Seiten umfassen, in ihrer Lage gehalten; in der Abb. 2 ist nur eine der Halteplatten 22, 32 sichtbar.

Die Rakeln 23, 33 stehen selektiv mit der Oberfläche der Aniloxwalze in Berührung, und sie verlaufen axial, d.i. senkrecht zur Zeichenebene der

Abb.2. Sie sind am Farbkasten befestigt. Um das selektive Anstellen der Rakeln 23, 33 in Abhängigkeit von der Walzendrehrichtung zu ermöglichen, kann der Farbkasten um den Gelenkzapfen 11b pendeln. Die Rakeln können axial in die Silikongummi-Hinterfütterung 5 eingedrückt sein, die sich leicht zusammendrücken läßt und sich um die Rakel vorwölbt, wie das schematisch bei 23, 24 gezeigt wird, wodurch eine gute Abdichtung gegen diese erzielt wird. Der Teflonstreifen 3 wird vorzugsweise mit scharfen Ecken ausgeführt.

Der Teflonstreifen 3 und die Silikon-Hinterfütterung 5 können in die Ausnehmung 13 eingesetzt werden, indem man sie, beispielsweise mit einem Kontakt-Kleber, darin einklebt.

Der Wasserkanal durch die Schrauben 14a, 14b und die Verbindungskanäle 15a, 15b durch das Trennelement 2 können ganz eng sein, beispielsweise etwa zwei bis drei Millimeter im Durchmesser, gerade genug, um Wasser auf die Filzkissen 21, 31 zu träufeln, so daß sich unter dem Teflonstreifen 3 ein Flüssigkeitsfilm ausbilden kann, der die benachbarten Zonen 10a, 10b ... und die entsprechenden Zonen auf der Aniloxwalze voneinander trennt. Die Bogenlänge der Filzstreifen kann bei einer Walze von etwa 28 cm Durchmesser ungefähr 7 bis 8 cm betragen.

Das Einbringen eines dünnen Wasserfilms zwischen den Teflonstreifen 3 und die Oberfläche der Aniloxwalze 10 hat den Vorteil, daß der Trennstreifen nicht die Aniloxwalze beschädigen kann, und daß eine Dichtung mit einer verlängerten Lebensdauer erzielt wird, die überdies nicht von der hohen Drehzahl der Aniloxwalze 10 beeinträchtigt wird. Die Verwendung von Wasser als Filmflüssigkeit hat einen zusätzlichen Vorteil, weil es das Austrocknen der flexographischen Druckfarbe auf der Aniloxwalze im Bereich der Druckfarbentrennebene verhindert und somit die schmirgelnden Eigenschaften der Druckfarben auf Wasserbasis eliminiert, die anderweitig den Verschleiß des Dichtungswerkstoffs durch das Ansetzen trockener Druckfarbe auf der Aniloxwalze verursachen würde.

Die Größe und Richtung des anzuwendenden Wasserstroms können leicht durch Bedienen des Dreiwegeventils 18 im Wasserzuleitungssystem zu den Kanälen 15a, 15b gesteuert werden. Die Menge kann leicht durch den Versuch ermittelt werden; es sollte gerade so viel Wasser benutzt werden, daß der Farbentrennbereich nicht austrocknet oder auf der Aniloxwalze hart wird. Neben der Wechselwirkung des Wasserfilms mit der Druckfarbe wirkt das Wasser noch zusätzlich als ein Schmiermittel, und es bildet einen Flüssigkeitsfilm auf dem Umfang der Aniloxwalze aus. Folglich schwimmt der Teflonstreifen 3 auf dem Film, und selbst wenn der Anpreßdruck beträchtlich ist, stellt sich ein Effekt ein, der dem Aquaplaning rollender Autoreifen auf einer nassen Straßenoberfläche ähnelt. Dieser Flüssigkeitsfilm beseitigt wirksam die Reibung und verlängert die Lebensdauer der Dichtung. Genau wie beim Aquaplaning der Autoreifen auf der Fahrbahn ist die Reibung sehr gering.

Die Farbwanderung quer durch die Trennebene wird wirksam unterbunden, weil der Flüssigkeitsfilm der Flüssigkeit das Verbleiben nur zwischen der Aniloxwalze und der Teflondichtung gestattet und andererseits das Eindringen von Druckfarbe zwischen die Teflondichtung und die Aniloxwalze verhindert. Somit wird die Wanderung von Druckfarbe mit einer bestimmten Eigenschaft, beispielsweise einer bestimmten Farbe, in die Druckfarbe mit einer anderen Eigenschaft, beispielsweise einer anderen Farbe, wirksam verhindert.

Die Benutzung einer eigenen Gummi-Hinterfütterung 5 ist nicht unbedingt notwendig, aber vorzuziehen. Sie kann leicht erneuert werden und sorgt für einen gleichmäßigen Dichtungsdruck. Ein Silikongummi mit geringer Härte, beispielsweise ein geschlossenzelliger Silikongummi mit dem Härtegrad (Durometer) 30, hinter dem Teflondichtstreifen angeordnet, sorgt für eine gleichbleibende, gleichmäßige Dichtpressung gegen die Fläche der Aniloxwalze. Der Silikongummi mit geringer Härte zwischen der Wand des Trennelements 2 und der Teflondichtung sorgt auch für eine wirksame Abdichtung an den Ecken der Rakeln. Diese Silikongummiart erlaubt eine Komprimierung um etwa 20 %, was die Ursache für die leichte Ausdehnung 24, 25 des Silikongummis um die Rakelenden und Rakelecken ist.

Für die Herstellung der den Wasserfilm erzeugenden Elemente 21, 31 können verschiedene Werkstoffe verwendet werden; Filz ist besonders geeignet, weil er ein dosiertes Aufträufeln oder Auftragen des Wassers unter den Trennstreifen 3 ermöglicht. Das Wasser kommt mit den oberhalb und unterhalb der Teflondichtung angeordneten Filzkissen 21, 31 in Berührung. Die Dichte des Filzes ist solcherart, daß eine gleichmäßige Verteilung des Wassers erreicht wird. Das Wasser sickert infolge der Schwerkraft in den unteren Teil der Filzkissen.

Diese Anordnung hat den zusätzlichen Vorteil, billig zu sein. Teflon ist wesentlich teurer als Silikongummi oder Filz, und durch die Verwendung eines dünnen, kleinen Teflonstreifens mit rückseitiger Hinterfütterung mit Silikongummi und mit Filzkissen zu beiden Seiten verringert sich die benötigte Teflonmenge. Das Teflon wird nur in den Bereichen des Farbkastens zwischen der oberen und der unteren Rakel gebraucht.

Gemäß einer vorteilhaften Ausgestaltung der Erfindung kann der ganze Farbkasten 11 zusammen mit dem Trennelement 2, dem Streifenelement 3, mit dessen Hinterfütterungselement 5 und

mit den Rakeln 23, 33 um den Zapfen 11b pendeln. Der Kasten 11 wird am Maschinenrahmen von der Konsole 40 gehalten, die mit einer Haltestange 41 gekuppelt ist, die um den Gelenkzapfen 11b pendeln kann, wie das durch den Pfeil 42 in Abb. 2 schematisch dargestellt ist. Die Haltestange 41 ist abgebrochen dargestellt, weil der Gelenkzapfen 11b - bezogen auf die Abb. 2 - in der Regel weiter links liegt, und er auf der Zeichnung normalerweise nicht sichtbar sein würde, weil er beispielsweise hinter dem Ventil 18 versteckt wäre. Die Lage in der Abb. 2 ist nur aus Gründen der klaren Darstellung gewählt worden. Der Farbkasten 11 ist üblicherweise trogförmig, um den Hohlraum 11a für die Druckfarbe zu bilden. Die Druckfarbe wird kontinuierlich durch Eintrittsöffnungen 45 in den Farbhohlraum 11a eingeleitet und an den Austrittsöffnungen 46 abgelassen, wobei die Druckfarbe im Farbhohlraum ständig in Umlauf gehalten wird. Die Aniloxwalze 10, welche die Rakeln 23, 33 berührt oder in einem ganz kleinen Abstand von ihnen steht, verhindert den Verlust von Druckfarbe.

Gemäß einer weiteren vorteilhaften Ausgestaltung der Erfindung kann der Farbkasten 11 in Bezug auf die Aniloxwalze 10 wegbewegt werden, so daß die beiden Rakeln 23, 33 den Kontakt mit der Aniloxwalze 10 verlieren. Die Bewegung ist ganz gering, ein Bruchteil von einem Millimeter. Dadurch wird die ständige Umwälzung der Flexodruckfarbe im Farbtrog 11a sowie die Rotation der Aniloxwalze 10 mit niedriger oder mit Leerlaufdrehzahl ermöglicht, wodurch das Antrocknen der Farbe an der Walze 10 während der Zeiten, in denen nicht gedruckt wird, vermieden und dabei die Trennung der verschiedenen Druckfarben, beispielsweise in den verschiedenen Zonen 10a, 10b, aufrechterhalten wird. Das Streifenelement 3 sowie die Kissen 21, 31 dehnen sich etwas aus - nachdem sie vorher zusammengedrückt gewesen waren - aber nicht so sehr, daß sie den Kontakt mit der Aniloxwalze verlieren würden. Wenn eines der Kissen 21, 31 oder beide Kissen über einem Teil des Umfangs den Kontakt verlieren sollten, so kann das wenig Schaden anrichten. Es wird genügend Wasser nachgeliefert, um einen ringförmigen Flüssigkeitsfilm entlang dem Streifen 3 auf der Aniloxwalze 10 zu bilden, so daß der Streifen 3 auf dem ringförmigen Film schwimmen oder gleiten und dadurch dauernd verhindern kann, daß die Farben aus den Zonen 10a, 10b sich vermengen oder ineinander verlaufen, während die Aniloxwalze sich immer noch weiterdrehen darf, wobei sie vor dem Farbenhohlraum 11a verbleibt. Die Bewegung des Farbtroges in der Weise, daß die Rakeln 23, 33 von der Walze 10 freikommen, d.h. gerade eben freikommen, wobei es dem Hinterfütterungsgummi 5 sowie auch den Kissen 21, 31 möglich ist, sich auszudehnen, kann auf jede geeignete Art und Weise erreicht werden. Wie in der Abb. 1 dargestellt ist, verläuft die gemeinsame Achse 50 längsseits des Farbwerks, parallel zum Farbtrog 11. Sie kann pendeln, wie durch den Pfeil 51 angedeutet wird. Die Achse 50 ist mit Hilfe eines Winkelhebels 52 mit der Tragstange 41 bzw. der Konzole 40 der Kippeinrichtung des Trennelements 2 gekoppelt.

Wirkungsweise:

Wenn die Aniloxwalze 10 im Uhrzeigersinn, in Vorwärtsdrehung, läuft, sollte das obere Kissen entfernt und das obere Tropfsystem abgestellt werden, indem man z.B. das Ventil 18 so stellt, daß das Wasser zum unteren Kissen 31 geleitet wird. Das untere Kissen 31 verbleibt an seinem Platz, und das untere Tropf-oder Wasserauftragsystem wird durch das Ventil 18 in Betrieb gesetzt, und durch diese Aktion trägt das Kissen 31 einen dünnen Wasserfilm auf die Walze 10 auf, der es dem Streifen 3 ermöglicht, auf dem Film zu - schwimmen. Nach dem Anlaufen der Walze 10 bildet sich auf der Walze 10 ein Wasserring aus, der die benachbarten Druckfarbenzonen voneinander trennt. Der Farbkasten 11 wird um die Achse 11b geschwenkt, siehe Pfeil 42, um die Rakel 23 außer Eingriff zu bringen. Die Gummi-Hinterfütterung 5 vergleichmäßigt den Berührungsdruck des Streifens 3 gegen die Walze 10. Nach dem Umsteuern der Drehrichtung der Aniloxwalze 10 in die Richtung entgegen dem Uhrzeiger kann das untere Tropfsystem durch Verändern der Stellung des Ventils 18 abgestellt und das untere Filzkissen 31 entfernt werden. Das obere Filzkissen 21 bleibt an seinem Platz, und das obere Tropfsystem wird eingeschaltet. Das nicht benetzte Kissen sollte entfernt werden, damit es nicht austrocknet. Das Entfernen des Filzkissens ist einfach, man braucht es nur herauszuziehen, auch kann man die Befestigungsschrauben lösen, die die betreffende Klemmplatte 22, 32 halten, und dann die jeweiligen Filzstreifen 21, 31 herausnehmen.

Unter normalen Druckbedingungen kann die Walze 10 z.B. mit Drehzahlen von mehr als 800 U/min laufen. Wenn die Maschine nicht druckt, war es üblich, den Farbenzufluß abzustellen und einen "Reinigungsvorgang" einzuschalten, um das Antrocknen der sich schnell verflüchtigenden Farbe auf der Aniloxwalze 10 und im Farbkasten zu verhindern. Gemäß dem Merkmal der vorliegenden Erfindung kann jedoch die Walze 10 im Leerlauf weiterlaufen gelassen werden, z.B. bei 30 U/min, wobei die Farbe kontinuierlich zwischen den Eintrittsöffnungen 45 und den Austrittsöffnungen 46 - in Abb. 1 nur in verschiedenen Farbzonen dargestellt - umgewälzt wird, während die Farbzonen voneinander getrennt bleiben. Nach dem Kippen

der Welle 50 entgegen dem Uhrzeigersinn des Pfeils 51 kommen beide Rakeln 23 und 33 außer Eingriff mit der Aniloxwalze 10. Die Kippachse der Welle 50 ist vorzugsweise im wesentlichen vertikal mit der Drehachse der Aniloxwalze 10 ausgerichtet, und, beispielsweise, etwas unterhalb des Farbtrogs 29. Die normale Zusammenpressung des Gummi-Hinterfütterungselements 5 kann beim Drucken etwa 20 % seiner ungespannten Nenndicke betragen, die der Filzkissen etwa 10 %. Ein leichtes Ankippen des Farbkastens 11 erlaubt eine gewisse Entspannung der Gummi-Hinterfütterung 5 und der Filzkissen 21, 31, jedoch ohne daß diese ihrer Funktion verlustig gehen würden. Auf diese Weise kann der Reinigungsvorgang während der Leerlaufperioden eliminiert werden. Die Streifenelemente 3 und die Kissen 21, 31 bleiben mit der Walze 10 in Berührung, und sie trennen so die Farbzonen, wobei sie die Kanten der Rakeln 23, 33 und die Oberfläche der Aniloxwalze schützen.

Innerhalb des Umfangs des Erfindungskonzepts können vielfältige Änderungen und Modifikationen vorgenommen werden.

Ansprüche

1. In einer Flexodruckmaschine

eine Anordnung zum Aufteilen eines Farbkastens (11) in verschiedene axiale Zonen (10a, 10b), um die Verwendung von Druckfarben mit jeweils unterschiedlichen Eigenschaften in verschiedenen Zonen einer Aniloxwalze (10) zu ermöglichen,

erfindungsgemäß beinhaltend

ein trennendes Streifenelement (3) mit einer gekrümmten Oberfläche, das an der Oberfläche der Aniloxwalze (10) anliegt und mit dieser zusammenpaßt, und das sich über einen Teil des Umfangs derselben erstreckt;

sowie Mittel (21, 14a, 15a; 31, 14b, 15b; 18) zum Einbringen eines hydraulischen Films einer Trennflüssigkeit zwischen die Oberfläche des Streifenelements (3) und die Oberfläche der Aniloxwalze (10) als Flüssigkeitsring im wesentlichen nur in jener Umfangsregion der Aniloxwalze, die den besagten Teil deren Umfang einschließt.

2. Die Anordnung nach Anspruch 1, in welcher die besagte Flüssigkeit Wasser enthält.

3. Die Anordnung nach Anspruch 1, in welcher die besagten Mittel zum Einbringen eines hydraulischen Films der Trennflüssigkeit ein Kisseneiement (21, 31) aus einer porösen Substanz beinhalten, das fluchtend mit dem besagten Trennstreifenelement (3) angeordnet ist; und

Mittel einer Flüssigkeits-Versorgungsleitung (14a, 15a; 14b, 15b) in Flüssigkeitsverbindung mit dem besagten Kisseneiement (21, 31) aus einer porösen Substanz.

4. Eine Anordnung nach Anspruch 3, in welcher zwei Kisseneiemente (21, 31) und zwei Mittel für eine Flüssigkeits-Versorgungsleitung vorgesehen sind, wobei die jeweiligen Kisseneiemente angrenzend an die äußersten Enden des besagten Trennstreifenelements (3) angeordnet sind.

5. Eine Anordnung nach Anspruch 3, in welcher die besagten Kisseneiemente aus einer porösen Substanz Filzkissen einschließen.

6. Eine Anordnung nach Anspruch 1, weiterhin beinhaltend ein Hinterfütterungselement (5), das angrenzend an das Trennstreifenelement (3) an dessen von der besagten Aniloxwalze (10) abgewandten Seite angeordnet ist, wobei das besagte Hinterfütterungselement ein zusammendrückbares Material einschließt.

7. Eine Anordnung nach Anspruch 6, in welcher das besagte zusammendrückbare Material Silikongummi einschließt.

8. Eine Anordnung nach Anspruch 6, weiterhin beinhaltend ein Trennelement (2), das eine Halterungsstruktur definiert, welche besagte Halterungsstruktur mit einer Ausnehmung (13) ausgeführt ist, die sich über einen Umfangsteil der besagten Aniloxwalze erstreckt, und wobei das besagte Hinterfütterungselement (5) in der besagten Ausnehmung gehalten wird;

und beinhaltend einstellbare Mittel (12), die mit dem Trennelement einstellbar im Eingriff stehen, um eine im wesentlichen radial gerichtete Kraft auf das besagte Hinterfütterungselement auszuüben und das Trennelement (3) gegen die Oberfläche der Aniloxwalze (10) anzudrücken.

9. Eine Anordnung nach Anspruch 6, weiterhin beinhaltend Rakelmittel (23, 33), die eine axiale Länge aufweisen, die sich bis zum Trennelement erstreckt, welche besagten Rakelmittel (23, 33) mit einer Kantenpartie mit dem besagten Hinterfütterungselement(5) aus zusammendrückbarem Material in Berührung steht, um es dem zusammendrückbaren Material zu ermöglichen, sich gegen die Rakelmittel auszubauchen und die Kante der Rakelmittel abzudichten.

10. Eine Anordnung nach Anspruch 1, weiterhin beinhaltend ein Trennelement (2), das eine Halterungsstruktur definiert;

elastische Hinterfütterungsmittel (5) zum elastischen Unterstützen des besagten Streifenelements (3) an der Halterungsstruktur für eine in dem Teil des Umfangs in hohem Maße gleichmäßige elastische Berührung des Streifenelements mit der Aniloxwalze (10);

Rakelmittel (23, 33), angeordnet am Farbkasten (11) und

Mittel (41, 42; 50, 51, 52), welche den Farbkasten beweglich abstützen, zum Zweck des selektiven Eingriffs der Rakelmittel an der Aniloxwalze oder des Abhebens der Rakelmittel um einen

kleinen Abstand, der ausreicht, um die Rakelmittel von der Aniloxwalze freizubekommen, während die elastische Berührung des Streifenelements (3) mit der Aniloxwalze (10) beibehalten und das Aufbringen der Trennflüssigkeit auf die Aniloxwalze mit den besagten Flüssigkeits-Anwendungsmitteln fortgesetzt wird.

11. Eine Anordnung nach Anspruch 10, in welcher die besagten Mittel zum Aufbringen des hydraulischen Trennflüssigkeitsfilms zwei dochtartige Kissenelemente (21, 31) aus einer porösen Substanz beinhalten, die fluchtend mit dem besagten Streifenelement (3) an den äußersten Enden des Streifenelements angeordnet sind;

in welcher zwei Rakeln vorgesehen sind, die die besagten Rakelmittel bilden, wobei eine erste Rakel (23) der Aniloxwalze in der einen Drehrichtung und eine zweite Rakel (33) der Aniloxwalze in der umgekehrten Drehrichtung zugeordnet ist;

und in welcher Anordnung die beweglichen Stützmittel den selektiven Angriff an der Aniloxwalze

(a) der ersten Rakel,

(b) der zweiten Rakel, und

(c) keiner der Rakeln

ermöglicht, während die Aniloxwalze (10) mit mindestens einem der besagten Kissenelemente (21, 31) in der Position der Flüssigkeitsübertragung verbleibt.

12. In einer Flexodruckmaschine ein Farbkasten (11), beinhaltend eine Anordnung zum Aufteilen des Farbkastens in verschiedene axiale Zonen (10a, 10b, ...), um die Farbe auf eine Aniloxwalze (10) in verschiedenen axialen Zonen auftragen zu können und die Verwendung von Druckfarben mit jeweils unterschiedlichen Eigenschaften, z.B. in verschiedenen Farben, in den verschiedenen Zonen zu ermöglichen,

erfindungsgemäß beinhaltend

ein Trennelement (2) mit einer Fläche, die an der Aniloxwalze (10) anliegt und sich über einen Teil des Umfangs derselben erstreckt;

ein Trennstreifenelement (3) mit einer gekrümmten Fläche aus reibungsarmem Material, die gegen die Oberfläche der Aniloxwalze anliegt und an diese angepaßt ist;

ein Hinterfütterungsmittel (5) aus zusammendrückbarem Material, befestigt an dem besagten Trennelement und das besagte Trennstreifenelement (3) in seiner Lage haltend und sich über einen Teil der Umfangslänge des besagten Trennelements (2) erstreckend;

ein Kissenelement (21, 31) aus einer flüssigkeitsdurchlässigen und porösen Substanz, gehalten von dem besagten Trennelement (2), angrenzend an die Endteile des Trennstreifenelements (3) und sich von den Endteilen des Trennstreifenelements weg erstreckend;

Mittel für die Flüssigkeitszufuhr (14a, 15a; 14b, 15b; 18), die eine Trennflüssigkeitsquelle mit dem besagten Kissenelement verbinden, um eine Trennflüssigkeit zu demselben zu fördern und infolgedessen auf der Oberfläche der Aniloxwalze (10) und zwischen der Oberfläche der Aniloxwalze (10) und dem Trennstreifenelement (3) einen Trennflüssigkeitsfilm ausbilden zu können;

und Mittel (12, 41, 42; 50, 51, 52) zum Anstellen des Trennelements (2) an die Oberfläche der Aniloxwalze (10).

13. Die Anordnung nach Anspruch 12, in welcher das besagte Trennstreifenelement Teflon einschließt, das besagte Hinterfütterungselement (5) Silikongummi einschließt und das besagte Kissenelement ein Filzkissen einschließt.

14. Die Anordnung nach Anspruch 12, in welcher das besagte Trennelement (2) eine Halterungsstruktur definiert;

zwei Kissenelemente vorgesehen sind, je eines an den äußersten Enden des Trennstreifenelements;

zwei Rakeln vorgesehen sind, eine erste Rakel (23), die der einen Drehrichtung der Aniloxwalze (10) zugeordnet ist und eine zweite Rakel (33), die der umgekehrten Drehrichtung der Aniloxwalze zugeordnet ist,

wobei die besagten Rakeln an dem besagten Farbkasten befestigt sind;

und in welcher Anordnung die Anstellmittel zum Anstellen des Trennelements gegen die Oberfläche der Aniloxwalze Mittel (41, 42; 50, 51, 52) beinhalten für die bewegliche Abstützung des Farbkastens zum Zweck des selektiven Anstellens einer der beiden besagten Rakeln an die Aniloxwalze in Abhängigkeit von der jeweiligen Drehrichtung der Aniloxwalze, oder zum Abheben beider Rakeln von der Oberfläche der Aniloxwalze durch Trennen der Rakelkanten von der Oberfläche der Aniloxwalze um einen kleinen Abstand, um die Aniloxwalze freizugeben, während die elastische Berührung des Streifenelements (3) mit der Aniloxwalze und mindestens eines Kissenelements mit der Aniloxwalze aufrechterhalten bleiben, um kontinuierlich Trennflüssigkeit zu der Aniloxwalze zu leiten und den besagten Trennflüssigkeitsfilm zwischen der Oberfläche der Aniloxwalze und der Oberfläche des Trennstreifenelements bilden zu können.

15. Verfahren zum gegenseitigen Abdichten von Druckfarben mit verschiedenen Eigenschaften in axialen Zonen (10a, 10b, ...) einer Aniloxwalze (10) mit Hilfe eines Trennelements (2, 3), beinhaltend den Schritt

der Einführung eines Umfangsrings eines Trennflüssigkeitsfilms zwischen den besagten Zonen durch Anlegen eines porösen, dochtartigen Kissens gegen die Oberfläche der Aniloxwalze

(10), sättigen des besagten Kissens mit der besagten Flüssigkeit und Gleiten des besagten Elements auf dem besagten Film.

16. Verfahren gemäß Anspruch 15, bei welchem die besagte Flüssigkeit Wasser einschließt.

17. Verfahren gemäß Anspruch 15, beinhaltend den Schritt, ein separates Streifenelement (3) einzuführen, das eine reibungsarme Oberfläche hat, die nach der Oberfläche der Aniloxwalze (10) gekrümmt und an diese angepaßt ist, und die sich über einen Teil des Umfangs derselben erstreckt;

das besagte Trennstreifenelement elastisch gegen den besagten Ring oder Film aus der Trennflüssigkeit anzulegen, und

worin der besagte Schritt der Einführung des Umfangrings oder -films die Einführung einer gerade ausreichenden Flüssigkeitsmenge einschließt, um ein effektives Gleiten des Trennstreifens auf dem Flüssigkeitsfilm zu erreichen.

18. Verfahren gemäß Anspruch 15 für die Anwendung in einer Flexodruckmaschine, die zwei Rakeln (23, 33) aufweist, die selektiv an die Aniloxwalze (10) anstellbar oder von ihr abhebbar sind,

in welchem der Schritt der Einführung des besagten Flüssigkeitsfilms das Aufrechterhalten des besagten Flüssigkeitsfilms auf der Aniloxwalze und das Fortdauern des Schwimmens des Trennelements auf dem besagten Film einschließt, auch wenn die Rakeln von der Aniloxwalze abgehoben sind.

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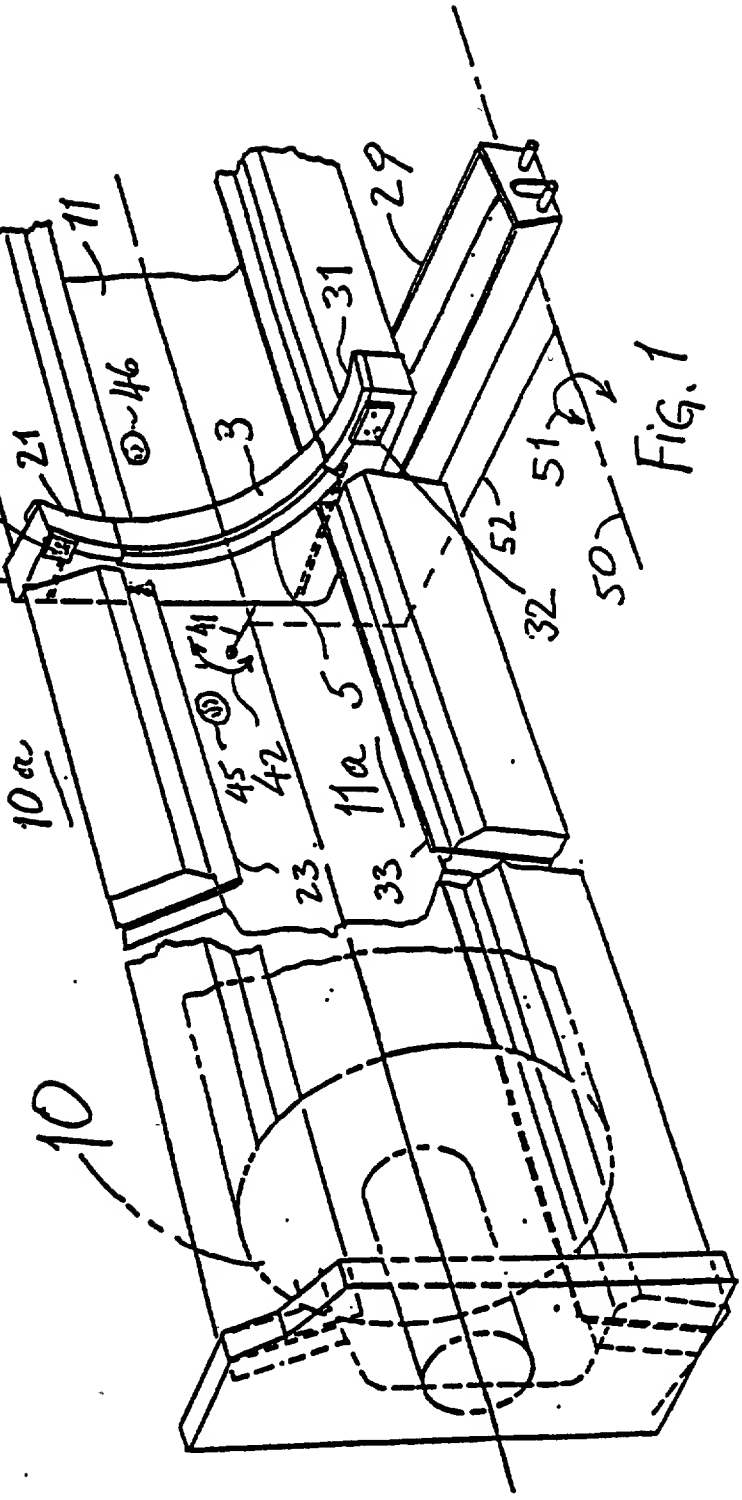

Fig. 1

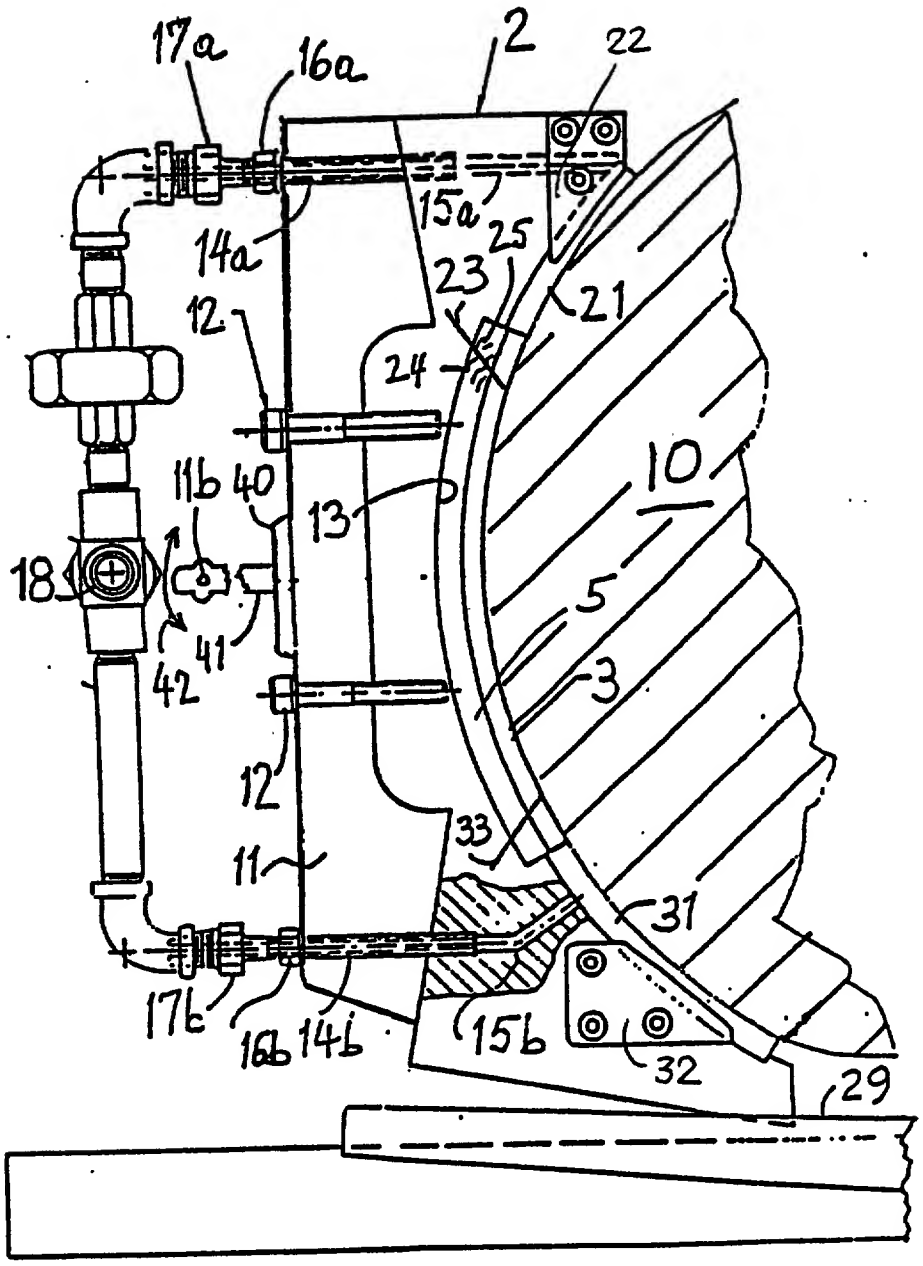

FIG. 2

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B41F 31/06

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B6C CEBE C104 C511 C514 C520

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GB 0924401 A US 4165688 A

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UK CL (Edition L) B6C CEBB CEBE CEBX
INT CL[5] B41F
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(54) Printing apparatus

(57) A divider seal 10 for a split-fountain chambered doctor blade for a printing press, comprising a seal contoured to sealingly engage a circumferential surface of a rotating cylinder, a seal retainer for retaining the seal in sealing engagement with the rotating cylinder, and pneumatic biasing structure, such as a pneumatic bladder, acting on the seal retainer for resiliently biasing the seal into sealing engagement with the rotating cylinder. The seal is located axially between the ends of the ink fountain 12 to allow different coloured inks to be used. A recess 38 is fed with water via channels 40, 42. Components of the seal may be of high molecular weight foam material aluminium or moulded plastics.

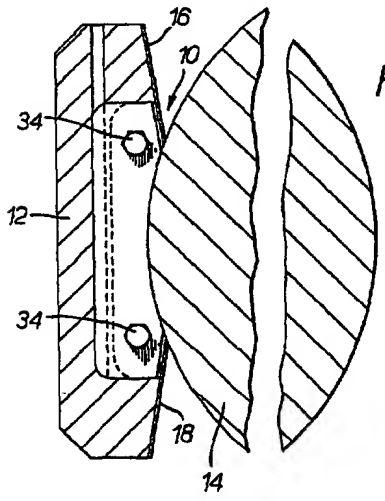

Fig. 1.

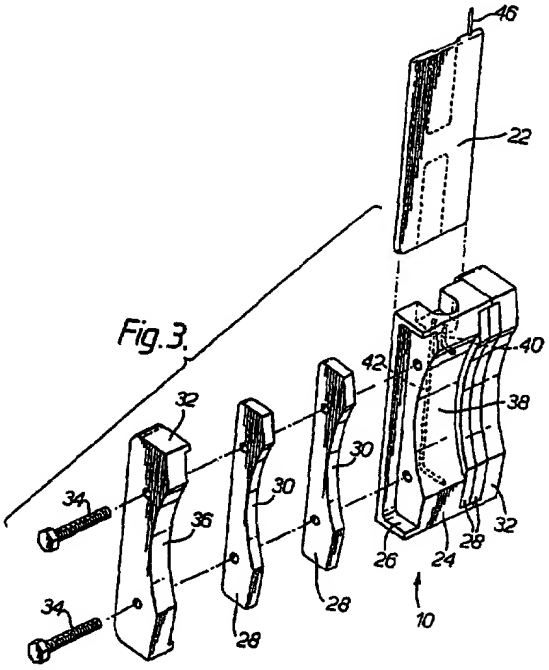

Fig. 3.

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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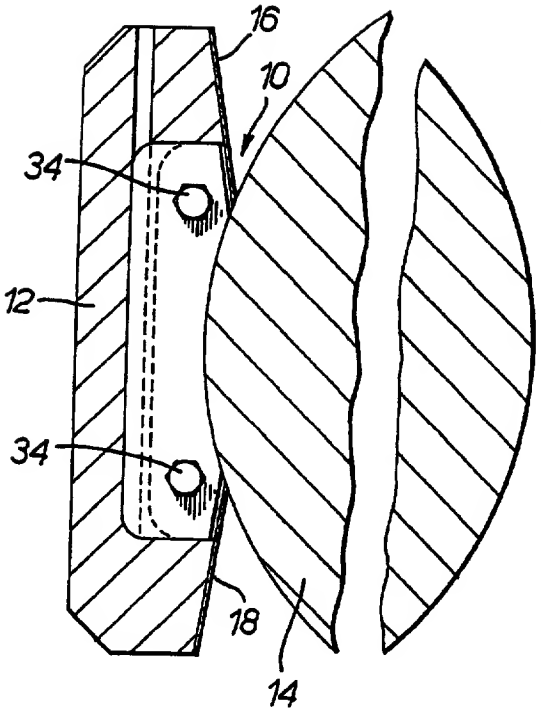
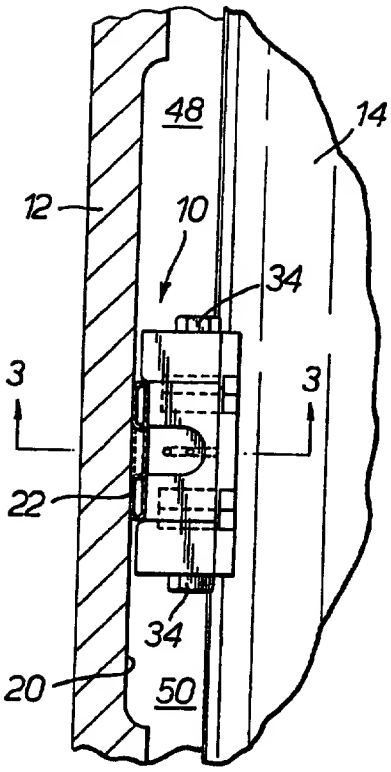


Fig. 1.

Fig. 2.



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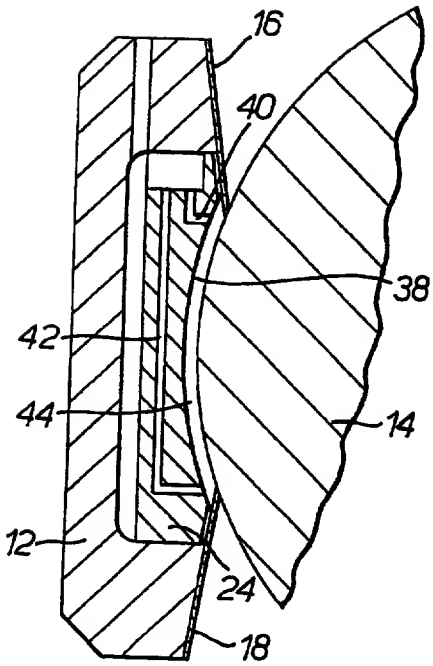
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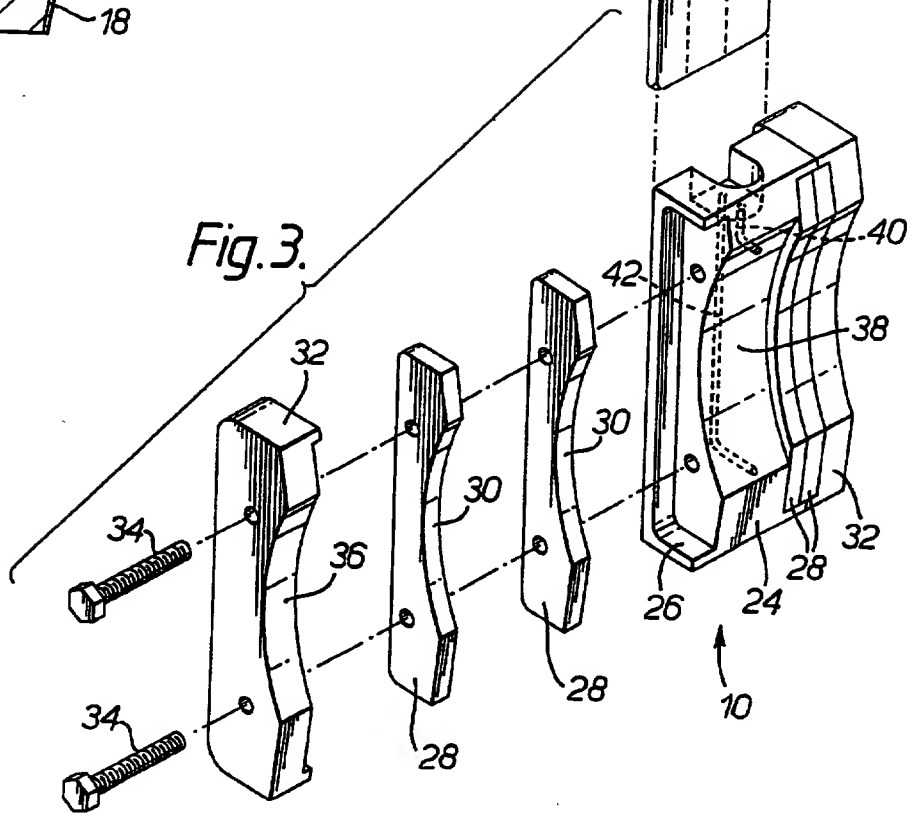
Fig.3.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Printing Apparatus

The present invention relates particularly to flexographic printing presses which utilise a chambered doctor blade ink fountain, and is more particularly concerned with split-fountain chambered doctor blades which permit simultaneous printing with two or more different colour inks, where the seal of the present invention may be used to divide the chambered doctor blade into two or more chambers.

Flexographic printing is a rotary letter press printing process which traditionally uses flexible rubber, or other elastomer, printing plates and liquid, fast drying ink. An advantage of flexographic printing is its simple ink distribution system.

In flexographic printing, a web to be imprinted is passed between an impression cylinder and a plate cylinder, from which the ink is transferred to the web. Ink is applied to the plate cylinder in precisely-controlled quantities by an anilox (R.T.M.) metering roll. The circumferential surface of the anilox roll is divided into a very large number of small cells (typically, 15,000 cell per square centimetre). The surface of the anilox roll is flooded with ink, thus filling the cells on the roll's surface. Ink is fed to the anilox roll by an ink fountain. A commonly-used ink fountain comprises an ink reservoir and a pair of doctor blades which contact the anilox roll above and below the reservoir. The surface of the anilox roll, the doctor blades and the reservoir define a closed chamber for containing the ink. As the anilox roll rotates, the doctor blades shave the surplus ink from the surface of the anilox roll so that ink is carried only in the interior of the cells on the roll's surface and not on the lands between cells. This results in a uniformly metered film of ink being applied to the surface of the plate cylinder.

Typically, the ink fountain extends the entire length of the anilox roll and plate cylinder. In cases where it is desired to print more than one colour on a web, which requires more than one colour of ink, the chamber containing the ink in the ink fountain is divided into two or more subchambers or compartments by ink dams or dividers. These dividers are designed to maintain a fluid-tight seal between compartments in the ink fountain and to maintain a seal against the anilox roll.

Ink fountain dividers per se are known in the art, and are illustrated in, for example, U.S. patents 3,381,517, 4,559,871, 4,667,595,

and 4,796,528.

These prior arrangements are mechanically very complex. They are thus expensive to fabricate, require careful and precise alignment, and are susceptible to misalignment in use. There is therefore a need for a simple, inexpensive divider seal which is easy to fabricate and install, requires no time-consuming alignment, can compensate for wear and misalignment, and still provides an effective divider seal. The present invention fulfils that need.

The present invention is a divider seal for a split-fountain chambered doctor blade for a printing press, comprising seal means contoured to sealingly engage a circumferential surface of a rotating cylinder, retaining means for retaining the seal means in sealing engagement with the rotating cylinder, and pneumatic biasing means acting on the retaining means for resiliently biasing the seal means into sealing engagement with the rotating cylinder.

The pneumatic biasing means offers a high degree of compliance and allows for variations in wear and alignment in use.

An example of apparatus according to this invention is shown in the accompanying drawings in which:

Figure 1 is a side elevational view, partially in section, of an ink fountain and an anilox roll, of which the ink fountain is equipped with the divider seal according to the present invention.

Figure 2 is a top plan view, partially broken away, of the divider seal and anilox roll shown in Figure 1.

Figure 3 is an exploded view of the divider seal according to the present invention.

Figure 4 is a sectional view, partially broken away, taken along the lines 3-3 of Figure 2.

Referring now to the drawings, wherein like numerals indicate like elements, there is shown in Figure 1 a divider seal 10 according to the present invention mounted in a chambered doctor blade ink fountain 12, in sealing engagement with an anilox roll 14. Anilox roll 14 has already been described and is known in the art, and need not be described in further detail, except to note that, as previously described, anilox roll 14 rotates on its axis relative to ink fountain 12. Also, ink fountain 12 has already been described and is known in the art, and will be described only with the degree of detail necessary to understand the present invention. In that regard, ink fountain 12 comprises upper and lower

doctor blades 16 and 18 which contact the surface of the anilox roll and meter the amount of ink supplied to the anilox roll by ink fountain 12. Doctor blades 16 and 18 are conventional and known in the art.

As seen in Figure 1, divider seal 10 has a sealing surface which is contoured to and contacts the surface of anilox roll 14 which extends into ink fountain 12 between doctor blades 16 and 18. Divider seal 10 is otherwise dimensioned to fit within the chamber of chambered doctor blade ink fountain 12, which is of uniform cross-section.

Figure 2 illustrates the divider seal 10 as seen from above, with ink fountain 12 partially in section to permit divider seal 10 to be clearly seen. As best seen in Figure 2, divider seal 10 is spaced a short distance from the rear wall 20 of ink fountain 12. Between the rear wall of ink fountain 12 and divider seal 10 is a biasing means in the form of a pneumatic bladder 22. Pneumatic bladder 22 may be pressurised and depressurised to apply more or less biasing force to divider seal 10, thereby controlling the loading force of divider seal 10 against anilox roll 14.

Referring now to Figure 3, the various parts of divider seal 10 are shown in an exploded view. Divider seal 10 comprises a manifold 24, which includes lateral recesses on either side. Recess 26 is visible in Figure 3. Recess 26 receives at least one, and preferably two, seal members 28. Seal members 28 are preferably made of an ultrahigh molecular weight closed foam material, and each seal means has a contoured surface 30 contoured to the curvature of anilox roll 14 so as to intimately engage the surface of anilox roll 14 when the seal means 28 are brought into contact with the surface of anilox roll 14. Seal means 28 and end cap 32 may be retained on manifold 24 by any suitable means, such as threaded fasteners 34. End cap seal 32 also has a contoured surface 36, which has substantially the same contour as contoured surface 30 of seal means 28.

Manifold 24 is substantially symmetrical along its longitudinal axis, and therefore receives a pair of seal means 28 and an end cap seal 32 on both sides.

Manifold 24 may be made of any suitable material. For example, manifold 24 may, for example, be machined from aluminium, or moulded in plastic. A preferred material for manifold 24 is aluminium with a Teflon (Registered Trade Mark) coating. End cap seals 32 are preferably moulded from an ultrahigh molecular weight plastic.

It will be seen in Figure 3 that, as with seal means 28 and end cap seals 32, manifold 24 has a contoured surface 38. However, contoured surface 28 is contoured to a curvature having a radius slightly greater than the curvature of contoured surfaces 30 and 36 of seal means 28 and end cap seals 32. This provides a small gap between anilox roll 14 and contoured surface 38, as best seen in Figure 3.

Referring now to Figure 4, manifold 24 is shown in section. Manifold 24 includes a pair of liquid flow channels 40 and 42. (Channels 40 and 42 are shown in phantom in figure 3.) These channels serve to supply and drain water to the gap 44 between contoured surface 38 and anilox roll 14. Gap 44 forms a water reservoir defined by contoured surface 38, anilox roll 14 and top and bottom doctor blades 16 and 18. Water is preferably supplied to reservoir 44 through flow channel 40 and drained, preferably by vacuum, through channel 42. The water in reservoir 44 fills the interstices in seal means 28, so that there is a film of water between seal means 29 and the surface of anilox roll 14. The film of water serves as both a low-friction bearing and a fluid seal.

Seal means 28 are biased into sealing engagement with anilox roll 14 by the pneumatic bladder 22. Bladder 22 is positioned between manifold 24 and the rear wall 20 of ink fountain 12, as previously described. Air is supplied to and exhausted from bladder 22 through an air supply conduit 46. By pressurising bladder 22, seal means 28 are biased into sealing engagement with the surface of anilox roll 14. The biasing force can be controlled by controlling the internal pressure of bladder 22. Since bladder 22 is pneumatically pressurised, bladder 22 is resilient. That is, bladder 22 permits divider seal 10 to move toward and away from rear wall 20 as anilox roll 14 rotates, to compensate for variations in the surface of anilox roll 14, such as a slightly out-of-round condition or slight misadjustment, for example where the ink fountain 12 is not exactly parallel to the axis of anilox roll 14. In addition, bladder 22 enables divider seal 10 to move toward anilox roll 14 to compensate for wear of both the surface of anilox roll 14 and the contoured surfaces 30 of the seal members 28, as a result of normal use. Since air is a compressible fluid, bladder 2 can be pressurised to a degree that will enable divider seal 10 to move toward and away from rear wall 20 of ink fountain 12, as may be required by out-of-round conditions in anilox roll 14, misalignments, and wear.

It will be appreciated that ink fountain 12 can be divided into two

or more compartments (see Figure 2) by using one or more divider seals 10. Thus, ink fountain 12 may be divided into two compartments 48 and 50 by using a single divider seal 10. If two divider seals are used, ink fountain 12 can be divided into three compartments, and so on, so that any number of compartments as desired may be provided.

It will also be noted that neither bladder 22 nor divider seal 10 are fixedly attached to rear wall 20 of ink fountain 12. Thus, divider seal 10 can be placed at any desired location along anilox roll 14, so that the lateral extent of the compartments 48 and 50 can be infinitely variable. Thus, the invention permits not only any desired number of compartments to be formed in ink fountain 12, but enables the lateral extent of the compartments so formed to be infinitely varied as desired. Hence, the present invention makes it very simple to reconfigure ink fountain 12 for different colours and dimensions. This reduces set-up time between printing runs, thereby reducing press down time and increasing equipment utilisation and throughput.

Claims

1. A divider seal for a split-fountain chambered doctor blade for a printing apparatus, comprising

a. seal means contoured to sealingly engage a circumferential surface of a rotating cylinder,

b. movable retaining means for retaining the seal means in sealing engagement with the rotating cylinder,

c. pneumatic biasing means movable with the retaining means and acting on the retaining means for resiliently biasing the seal means into sealing engagement with the rotating cylinder.

2. A divider seal according to claim 1, wherein the pneumatic biasing means comprises a pneumatic bladder.

3. A divider seal according to claim 2, further comprising means for selectably increasing and decreasing the pneumatic pressure in the bladder.

4. A divider seal according to claim 2, wherein the seal means comprises an ultra-high molecular weight closed foam.

5. A divider seal according to claim 1, further comprising a gap between the retaining means and the circumferential surface of the rotating cylinder, and means for supplying a liquid to said gap to form a liquid interface between said retaining means and circumferential surface.

6. A flexographic printing apparatus having an anilox roll and a chambered doctor blade ink fountain adjacent the anilox roller for applying printing ink thereto, a movable divider seal for dividing the doctor blade chamber into at least two compartments, the compartments containing different colour inks therein, said divider seal comprising a seal member contoured to and in sealing engagement with the outer circumferential surface of the anilox roller, a seal retainer for retaining the seal member in engagement with the circumferential surface of the anilox roller, and an inflatable and deflatable pneumatic bladder mounted between the back surface of the seal retainer and an

opposed wall of the doctor blade assembly for applying a biasing force to the seal retainer and the seal member for resiliently biasing the seal member into engagement with the circumferential surface of the anilox roller.

7. A divider seal according to claim 6, wherein said pneumatic bladder is positioned between the seal retainer and a rear wall of the ink fountain.

8. A divider seal according to claim 7, wherein the divider seal is infinitely positionable along the length of the anilox roll between the anilox roll and said rear wall of the ink fountain.

9. Printing apparatus comprising an ink fountain mounted adjacent to a roll adapted to receive a film of ink from the fountain, the fountain comprising means defining an ink chamber extending parallel to the axis of the roll, at least a portion of the chamber being of uniform cross-section and containing chamber divider which is selectively positionable at various positions in the uniformly sectioned part of the chamber and includes at least one sealing portion having a concave surface adjacent to and conforming with the surface of the roll, and including a bladder positioned between a back surface of the divider and an opposed wall of the chamber and adapted to seal the gap between the said back surface and the chamber wall and, when pressurised, to bias the concave seal surface of the divider resiliently into sealing engagement with the roll.

10. Printing apparatus according to claim 9, in which the said back surface of the divider and the said opposed chamber wall are both substantially flat and are both substantially parallel to a tangent to the roll at approximately a mid-point along the said concave surface of the sealing portion, whereby expansion of the bladder produces a series of biasing forces on the divider which are substantially parallel to a radius of the roll at the said mid-point.

11. Printing apparatus according to claim 9 or claim 10, in which the chamber divider includes a second sealing portion spaced from and similar to the first-mentioned sealing portion, the surface of the

divider between the sealing portions being recessed to define a semi-annular chamber adjacent to the roll, and including means for delivering liquid into the semi-annular chamber to form an additional barrier, supplementing the sealing effects of the seal portions, between inks contained during use in the portions of the ink chamber on opposite sides of the divider.

12. Apparatus according to any one of claims 1 to 11 and substantially as described with reference to the accompanying drawings.

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Relevant Technical fields

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Databases (see over)

(i) UK Patent Office

(ii) ONLINE DATABASE: WPI

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Documents considered relevant following a search in respect of claims 1-12

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	GB 0924401 A - (TIMSON) see element 5, figure 2	1-3,6,9
X	US 4165688 A - (MAGNA-GRAPHICS) see example figure 2	1-3,6,9

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family, corresponding document.

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).

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HAUPTPATENT

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Farbwerk für Buchdruck-, Offsetdruck- und dergleichen Maschinen für Farbendruck

Beim Druck von Tageszeitungen und Zeitschriften ist es für das bessere Hervorheben von einzelnen Annoncen wünschenswert, diese spaltenweise oder seitenweise in verschiedenen Farben drucken zu können, ohne dabei mehr als ein Farbwerk beanspruchen zu müssen. Zu diesem Zweck muß, wenn nicht besondere Einrichtungen vorhanden sind, beim Umstellen auf mehrere nebeneinanderliegende Farben das ganze Farbwerk sauber gereinigt werden. Das Reinigen der Farbwerkwalzen geht dabei sehr rasch und mühelos vor sich, da hierfür Apparate verwendet werden können, welche das Reinigen maschinell besorgen. Ganz anders verhält es sich mit dem Farbkasten. Dieser muß von Hand sauber von allen Spuren der vorhergehenden Farbe befreit werden. Die Unterteilung kann erst dann durch Einsetzen von Abteilwänden in den Farbkasten vorgenommen werden. Man hat daher nach Mitteln gesucht, das Reinigen des Farbkastens zu umgehen, indem man zusätzliche, komplette Farbkasten mit besonderen Duktoren und Farbmessern, oder komplette Pumpen, meist eine Seite breit, fest oder auswechselbar in die Maschine eingebaut hat. Diese Zusatzapparate übertragen dann ihre Farbe an anderer Stelle an die Farbwerkwalzen, als dies beim normalen Druck mit nur einer Farbe der Fall ist. Diese Zusatzaggregate haben verschiedene Nachteile. Einmal sind sie recht teuer, da sie die komplette Farbdosierungseinrichtung enthalten, wenn auch kleiner als die ohnehin für einfarbigen Druck vorhandene Einrichtung. Viele Inserenten wünschen nicht nur eine bestimmte Grundfarbe, sondern einen bestimmten Farbton, welcher oft mit der Verpackung des angepriesenen Artikels übereinstimmen muß. Daraus ergibt sich die Notwendigkeit, diese Zusatzapparate jeweils doch reinigen zu müssen oder aber eine ganze Menge solcher Apparate anzuschaffen. Die Montage der Zusatzapparate muß zudem recht genau sein, da von der Genauigkeit der Montage die Güte der Farbgebung abhängt. Das genaue Montieren der Zusatzapparate in stark verschmutzte Maschinen, vorgenommen durch mechanisch ungeschultes Personal, ist jedoch eine heikle Sache. Als weiterer Nachteil ist zu nennen, daß das Farbregulieren immer an diesen Zusatzapparaten selbst, also in der laufenden Maschine, vorgenommen werden muß, während an den Einrichtungen, welche für den Einfarbendruck ohnehin vorhanden sind, oft die Bequemlichkeit vorhanden ist, daß die Farbschrauben von außerhalb der Maschine aus bedienbar sind. Mit den erwähnten Zusatzapparaten geht somit diese Bequemlichkeit für den Farbendruck verloren.

Die Erfindung beseitigt diese Nachteile. Sie benützt eine Duktorwalze, die zur Führung der Teilfarbbehälter Rillen aufweist, die die Teilfarbbehälter an den Seitenwänden

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【発明の名称】 あらゆる輪転オフセット印刷機の第１の印刷ユニット又はそれに続くいずれかの印刷ユニットの湿し装置側から版胴及びブランケット胴上で同時に作動可能な引込み式印刷／コーティングユニット

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【書類名】　明細書

【発明の名称】　あらゆる輪転オフセット印刷機の第１の印刷ユニット又はそれに続くいずれかの印刷ユニットの湿し装置側から版胴及びブランケット胴上で同時に作動可能な引込み式印刷／コーティングユニット

【特許請求の範囲】

【請求項１】　第１及び第２の印刷ユニットを含むタイプの輪転オフセット印刷機において、第１の印刷ユニットには、

－　上にフレキソ印刷版が取りつけられた版胴；

－　フレキソ印刷版から水性又はフレキソ印刷インキ又はコーティング材料を収容するためにフレキソ印刷版とインキ又はコーティング移送係合状態で配置されているブランケットを有するブランケット胴；

－　ブランケット胴に隣接して配置され、かくしてブランケットとの間にニップを形成し、こうして水性又はフレキソ印刷用インキ又はコーティング材料は、下地材がニップを通して移送されるにつれてブランケットから下地材まで移送され得るようになっている、圧胴；

－　刷り中の作動的位置まで及び非刷り中の引込み位置までの動きのため印刷ユニットに可動な形で結合されているインキング／コーティング装置

が含まれており、

－　インキング／コーティング装置が、水性又はフレキソ印刷用インキ又はコーティング材料を一定体積収容するためのコンテナ手段、及びこの装置が刷り中の作動的位置にある場合にフレキソ印刷版又はブランケットに対し水性又はフレキソ印刷用インキ又はコーティング材料を塗布するためにコンテナ手段に結合されている少なくとも１つのアプリケータローラを含んでおり；

－　コンテナ手段が、それを分割して第１のコンテナ領域と第２のコンテナ領域を構成する仕切り用ダムを有し；

－　少なくとも１本のアプリケータローラが第１及び第２の移送表面及び第１及び第２の移送表面を分離する手段を有し；

－　少なくとも１本のアプリケータローラの第１及び第２の移送表面が、第１及び第２のコンテナ領域内にそれぞれ収納された水性又はフレキソ印刷用インキ又

はコーティング材料と転がり接触状態となるよう、第１及び第２のコンテナ領域内に配置されている、輪転オフセット印刷機。

【請求項２】　－　前記分離手段がアプリケータローラ上に配置された環状シール要素であり；

－　仕切り要素はアプリケータローラの環状シール要素に対して密封係合状態で配置されている請求項２に記載の輪転オフセット印刷機。

【請求項３】　－　前記コンテナ手段が、開放型インキ出しパンであり、

－　前記分離手段が、アプリケータローラを横断し、第１及び第２の移送表面を分離する環状溝であり；

－　仕切り要素は、第１及び第２のタンク領域の間でインキ出しパン上に取りつけられ、環状溝上に配置された分離板である請求項１に記載の輪転オフセット印刷機。

【請求項４】　第１の印刷ユニット内へ枚葉紙状の下地材を連続的に供給するために第１の印刷ユニットに結合された枚葉紙供給手段を含んでいる、請求項１に記載の輪転オフセット印刷機。

【請求項５】　連続巻取紙状の下地材を第１の印刷ユニット内へ連続的に供給するために第１の印刷ユニットに結合された巻取紙供給手段を含んでいる、請求項１に記載の輪転オフセット印刷機。

【請求項６】　－　前記コンテナ手段が、それぞれ第１及び第２の水性又はフレキソ印刷用インキ又はコーティング材料を収納するために第１及び第２のパン区分をもつインキ出しパンであり；

－　前記アプリケータローラが、第１及び第２の移送表面ならびに、これらの表面を分離する環状溝を有しており；

－　パンローラには、それぞれ、水性又はフレキソ印刷用インキ又はコーティング材料を第１及び第２のパン区分からアプリケータローラの第１及び第２の移送表面まで別々に移送するための、第１及び第２のパン区分内で回転するようにとりつけられた第１及び第２の移送表面が備わっている請求項１に記載の輪転オフセット印刷機。

【請求項７】　－　前記コンテナ手段が、第１及び第２のタンクチャンバを

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もつ密封形ドクターブレードヘッドであり、前記仕切り用ダムはドクターブレードヘッド上にとりつけられ、第１及び第２のタンクチャンバを分離しており；

－ 少なくとも１本のアプリケータローラが、それぞれ第１及び第２のタンクチャンバ内で水性又はフレキソ印刷インク又はコーティング材料と転がり接触するよう配置された第１及び第２の流体計量用移送表面をもつアニロックストランスファローラを含んで成り；

－ 分離手段は、第１及び第２の移送表面の間でアプリケータローラ上に形成されたシールバンドであり；

－ 仕切り用ダムは、結合位置においてシールバンドと密封係合状態で配置されている、請求項１に記載の輪転オフセット印刷機。

【請求項８】 インキング／コーティング装置には、

－ インキング／コーティング装置が作動的位置にある場合、版又はブランケットと係合するべく第１のアプリケータローラを支持するための第１のクレードル手段；

－ インキング／コーティング装置が作動的位置にある場合、版又はブランケットと係合するべく第２のアプリケータローラを支持するための第２のクレードル手段；

－ 第１のクレードル手段上で回転するようにとりつけられ、第１及び第２の移送表面及び第１及び第２の移送表面を分離するシールバンドを有する第１のアプリケータローラ；

－ 第２のクレードル手段上で回転するようにとりつけられ、第１及び第２の移送表面及びこれらの表面を分離する手段を有する、第２のアプリケータローラ；

－ 第１及び第２のタンクチャンバ及びこれらのタンクチャンバを分離する仕切り要素を有する、一定体積のインキ又はコーティング材料を収納するための第１のタンク手段；

－ 第１及び第２のタンクチャンバ及びこれらのタンクチャンバを分離する仕切り要素を有する、一定体積のインキ又はコーティング材料を収納するための第２のタンク手段

が含まれており、

－　第１及び第２のタンク手段は、それぞれ第１及び第２のアプリケータローラに結合されており、第１のアプリケータローラの第１及び第２の移送表面が、第１のタンク手段のそれぞれ第１及び第２のタンクチャンバ内でインキ又はコーティング材料と転がり接触するように配置されており、第１の仕切り用シール要素が、結合位置で第１のアプリケータローラの分離手段に対して密封係合状態で配置されており；

－　第２のアプリケータローラの第１及び第２の移送表面は、第２のタンク手段のそれぞれ第１及び第２のタンクチャンバ内でインキ又はコーティング材料と転がり接触状態となるように配置されており、第２のタンク手段の仕切り要素が、結合位置で第２のアプリケータローラの分離手段と密封係合状態に配置されている請求項１に記載の輪転オフセット印刷機。

【請求項９】　－　少なくとも１本のアプリケータローラが第１及び第２の流体計量用移送表面をもつアニロックスローラであり；

－　第１の移送表面の体積容量が第２の移送表面の体積容量と異なっている請求項１に記載の輪転オフセット印刷機。

【請求項１０】　インキング／コーティング装置には、

－　クレードル手段；

－　第１及び第２のタンクチャンバ及びこれらのチャンバを分離する仕切り要素をもつ、インキ又はコーティング材料を一定体積収納するためのタンク手段

が含まれ；

－　少なくとも１本のアプリケータローラがクレードル手段上で回転するようにとりつけられており、このアプリケータローラが第１及び第２の移送表面及び第１及び第２の計量用移送表面を分離する手段を有しており；

－　少なくとも１本のアプリケータローラは、それぞれ第１及び第２のタンクチャンバ内のインキ又はコーティング材料と転がり接触状態となるように第１及び第２の流体計量用移送表面が配置されている状態でタンク手段に結合されており、仕切り要素が結合位置でアプリケータローラの分離用手段と密封係合状態に配置されており；

－　第１の移送表面の体積容量が第２の移送表面の体積容量と異なっている請求

項１に記載の輪転オフセット印刷機。

【請求項１１】　インキング／コーティング装置には、

－　一定体積の液体インキ又はコーティング材料を収納するためのインキ出しパン；

－　計量用表面を有するアプリケータローラ；及び

－　インキ出しパン内で回転するようにとりつけられ、しかも、インキ出しパンからアプリケータローラまでインキ又はコーティング材料を移送するためのアプリケータローラに結合されたパンローラ

が含まれている、請求項１に記載の輪転オフセット印刷機。

【請求項１２】　－　第１の印刷ユニットの圧胴と下地材移送関係で結合され、かつ第２の印刷ユニットと下地材移送関係で結合されているトランスファドラム；

－　印刷又はコーティングされたばかりの下地材が第１の印刷ユニットの圧胴と接触している間にこの下地材上に加熱空気を放出するために第１の印刷ユニットの圧胴に隣接して取りつけられた第１の乾燥装置；

－　印刷又はコーティングされたばかりの下地材が第１の印刷ユニットの圧胴から移送された後、それが渡し胴と接触している間にこの下地材上に加熱空気を放出するためにトランスファドラムに隣接してとりつけられている第２の乾燥装置；及び

－　印刷又はコーティングされたばかりの下地材がトランスファドラムから移送された後、第２の印刷ユニット上で印刷又はその他の処理を受ける前に、この下地材に加熱空気を放出するために２の印刷ユニットに隣接して配置された第３の乾燥装置

をさらに含む、請求項１に記載の輪転オフセット印刷機。

【請求項１３】　インキ又はコーティング材料を塗布するための手段には、

－　第１のクレードル手段；

－　インキ又はコーティング材料を収納するため第１のクレードル手段上に取りつけられた第１のタンク又はインキつぼ手段；

－　第１のクレードル手段上で回転するように取りつけられ、第１のタンク又は

インキつぼ手段内でインキ又はコーティング材料と転がり接触状態となるように配置され、版胴上の印刷版と係合可能である、第１のアプリケータローラ；

－　第２のクレードル手段；

－　インキ又はコーティング材料を収容するために第２のクレードル手段上にとりつけられた第２のタンク又はインキつぼ手段；及び

－　第２のクレードル手段上で回転するようにとりつけられ、第２のタンク又はインキつぼ手段内でインキ又はコーティング材料と転がり接触するように配置され、作動的位置でブランケット胴上にとりつけられた版又はブランケットと係合可能である、第２のアプリケータローラ

が含まれている、請求項１に記載の輪転オフセット印刷機。

【請求項１４】　インキング／コーティング装置が、前記少なくとも１つのアプリケータローラとブランケット又は版の間のニップ接触点が版胴又はブランケット胴の中心を通って印刷／コーティングユニットの回転軸まで延びる半径ラインとの関係においてオフセットされているような位置で、印刷ユニット上に旋回可能な形で取りつけられている、請求項１に記載の輪転オフセット印刷機。

【請求項１５】　－　前記少なくとも１本のアプリケータローラには、第１及び第２の移送表面及びこれらの移送表面の間に配置されてこれらを分離しているシールバンド表面が備わっており；

－　タンク手段にはチャンバ及びチャンバ内に配置された仕切り部材があり、この仕切り部材は、チャンバを分割して第１のタンクチャンバ領域と第２のタンクチャンバ領域を構成しており；

－　仕切り部材表面はアプリケータローラのシールバンドに対して密封係合状態で配置されている請求項１に記載の輪転オフセット印刷機。

【請求項１６】　インキング／コーティング装置には、

－　インキング／コーティング装置が作動的位置にある場合、版又はブランケットと係合するべく第１のアプリケータローラを支持するための第１のクレードル手段；

－　インキング／コーティング装置が作動的位置にある場合、版又はブランケットと係合するべく第２のアプリケータローラを支持するための第２のクレードル

手段；

－　第１のクレードル手段上で回転するようにとりつけられ、第１及び第２の流体計量用移送表面及びこれらの移送表面を分離する分離バンドを有する第１のアプリケータローラ；

－　第２のクレードル手段上で回転するようにとりつけられ、第１及び第２の流体計量用移送表面及びこれらの移送表面を分離する分離バンドを有する第２のアプリケータローラ；

－　第１及び第２のタンクチャンバ及びこれらのタンクチャンバを分離する第１の仕切り要素を有する、一定体積のインキ又はコーティング材料を収納するための第１のタンク手段；

－　第１及び第２のタンクチャンバ及びこれらのタンクチャンバを分離する第２の仕切りシール要素を有する、一定体積のインキ又はコーティング材料を収納するための第２のタンク手段

が含まれており、

－　第１のアプリケータローラの第１及び第２の流体計量用移送表面が第１のタンク手段のそれぞれ第１及び第２のタンクチャンバ内でインキ又はコーティング材料と転がり接触するように配置されており、第１の仕切り要素が、結合位置で第１のアプリケータローラの分離バンドに対して密封係合状態で配置されており；

－　第２のアプリケータローラの第１及び第２の流体計量用移送表面は、第２のタンク手段のそれぞれ第１及び第２のタンクチャンバ内でインキ又はコーティング材料と転がり接触状態となるように配置されており、第２のタンク手段の第２の仕切り要素が、結合位置で第２のアプリケータローラの分離バンドと密封係合状態に配置されている請求項１に記載の輪転オフセット印刷機。

【請求項１７】　インキング／コーティング装置には、

－　インキング／コーティング装置が作動的位置にある場合、版又はブランケットと係合するべく第１のアプリケータローラを支持するための第１のクレードル手段；

－　インキング／コーティング装置が作動的位置にある場合、版又はブランケッ

トと係合するべく第２のアプリケータローラを支持するための第２のクレードル手段；

－　第１のクレードル手段上にとりつけられ、一定体積のインキ又はコーティング材料を収納するためのタンクチャンバを有する第１のタンク手段；

－　第２のクレードル手段上にとりつけられ、一定体積のインキ又はコーティング材料を収納するためのタンクチャンバを有する第２のタンク手段；

－　第１のクレードル手段上で回転するようにとりつけられ、流体計量用移送表面を有する、第１のアプリケータローラ；

－　第２のクレードル手段上で回転するようにとりつけられ、流体計量用移送表面を有する、第２のアプリケータローラ

が含まれており、

－　第１及び第２のアプリケータローラがそれぞれ第１及び第２のタンク手段に結合されており、第１及び第２のアプリケータローラの流体計量用移送表面は、それぞれ第１及び第２のタンク手段のタンクチャンバ内でインキ又はコーティング材料と転がり接触状態となるように配置されており；

－　第１のアプリケータローラの流体計量用表面の体積容量が第２のアプリケータローラの流体計量用表面の体積容量と異なっている請求項１に記載の印刷機。

【請求項１８】　インキ又はコーティング材料を塗布する手段には、

－　クレードル手段；

－　クレードル手段上で回転するようにとりつけられ、第１及び第２の表面ならびに第１及び第２の移送表面を分離するシールバンドを有するアプリケータローラ；

－　第１及び第２のタンクチャンバ及びこれらのタンクチャンバを分離する仕切り要素をもつ、一定体積のインキ又はコーティング材料を収納するためのタンク手段

が含まれており、

－　アプリケータローラは、第１及び第２の移送表面がそれぞれ第１及び第２のタンクチャンバ内でインキ又はコーティング材料と転がり接触状態となるように配置されている状態で、タンク手段に結合されており、仕切り要素は、結合位置

でアプリケータローラのシールバンドに対して密封係合状態で配置されており；

－　第１の流体計量用移送表面の体積容量が、第２の流体計量用移送表面の体積容量と異なっている、請求項１に記載の印刷機。

【請求項１９】　－　一定体積の液体インキ又はコーティング材料を収納するための供給物コンテナ；

－　前記供給物コンテナからインキング／コーティング装置まで液体インキ又はコーティング材料の流れを誘発し、インキング／コーティング装置から供給物コンテナまで液体インキ又はコーティング材料を戻すための、供給物タンクとインキング／コーティング装置の間に結合された循環手段；及び、

－　液体インキ又はコーティング材料の温度を予め定められた温度範囲内に維持するため、循環手段に結合された熱交換器手段

をさらに含む、請求項１に記載の輪転オフセット印刷機。

【請求項２０】　インキング／コーティング装置が、版胴又はブランケット胴の中心を通って印刷／コーティングユニットの回転軸まで延びる半径ラインとの関係においてアプリケータローラとブランケット又は版の間のニップ接触点がオフセットされているような位置において、第１の印刷ユニット上に旋回する形でとりつけられている、請求項１に記載の印刷機。

【請求項２１】　印刷又はコーティングされたばかりの下地材がひきづつき第２の印刷ユニットで印刷、コーティング又はその他の処理を受ける前に、この下地材上に加熱空気を放出するため、第１の印刷ユニット上にとりつけられた乾燥装置

を含む、請求項１に記載の印刷機。

【請求項２２】　乾燥装置が、印刷又はコーティングされたばかりの下地材が前記圧胴と接触している間にこの下地材上に加熱空気を放出するため、この圧胴に隣接してとりつけられている、請求項２１に記載の印刷機。

【請求項２３】　－　印刷機上にユニット間位置で配置され、第１の印刷ユニットの圧胴と下地材移送関係で結合されている下地材移送装置；

－　印刷又はコーティングされた下地材が第１の印刷ユニットから移送された後、下地材移送装置と接触している間にこの下地材上に加熱空気を放出するため、

下地材移送装置に隣接して配置されたユニット間乾燥装置
をさらに含む、請求項１に記載の印刷機。

【請求項２４】　－　印刷又はコーティングされたばかりの下地材上に加熱空気を放出するため、第１の印刷ユニット上にとりつけられた乾燥装置；及び
－　乾燥装置と印刷又はコーティングされたばかりの基板の間の露呈ゾーンから高温空気及び水蒸気を抽出するため、乾燥装置に結合された抽出装置
を含んで成る、請求項１に記載の印刷機。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】

本発明は一般に、枚葉紙供給型又は巻取紙供給型輪転オフセット石版印刷機、より詳細に言うと、あらゆる石版印刷機の第１の又はそれに続くいずれかの印刷ユニットの版及びブランケットに対し同時に塗布される水性又はフレキソ印刷用インキ、下塗剤又は保護／装飾コーティングのインライン塗布のための新しくかつ改良型のインキング／コーティング装置に関する。

【０００２】

【従来の技術】

従来の枚葉紙供給型輪転オフセット印刷機は、標準的に、個々の枚葉紙が中に供給され印刷される単数又は複数の印刷ユニットを含んでいる。最後の印刷ユニットの後、印刷されたばかりの枚葉紙は、デリバリコンベヤによって印刷機のデリバリ端部まで移送され、ここで、印刷及び／又はコーティングされたばかりの枚葉紙は収集され、均等に積み重ねられる。標準的な枚葉紙供給型輪転オフセット石版印刷機、例えばハイデルベルグスピードマスター印刷機ラインにおいて、デリバリコンベヤは、最後の圧胴から印刷されたばかりの枚葉紙をつかみ、そして引っぱり、枚葉紙を枚葉紙デリバリスタッカまで搬送するグリッパ棒を支持する一対のエンドレスチェーンを含んでいる。

【０００３】

枚葉紙供給型輪転オフセット印刷機と共に用いられるインキは通常、湿潤であり、かつ粘着性があるため、１つの印刷ユニットからもう１つの印刷ユニットま

で枚葉紙が移送されるにつれて、この印刷又はコーティングされたばかりの枚葉紙がマーキング及び汚損を受けることのないように特別な予防措置を講じなければならない。枚葉紙の表面上の印刷されたインキは比較的緩慢に乾燥し、印刷ユニット間でのその後の移送中に容易に汚される。マーキング、汚損及びしみは、すべて共同発明者であるHoward W. DeMoore に対するものである米国特許第５，１１３，２５５号；５，１２７，３２９号；５，２０５，２１７号；５，２２８，３９１号；５，２４３，９０９号；及び５，４１９，２５４号に記述され、米国テキサス州ダラスのPrinting Research Inc.がその商標ＢＡＣＶＡＣTMの名で製造販売している真空式枚葉紙移送装置によって防ぐことができる。

【０００４】

一部の印刷業務では、印刷されたばかりの枚葉紙のすべて又は一部分上に保護及び／又は装飾用コーティング材料を塗布することによって、裏移りが防がれている。一部のコーティングは、インキが裏移りしないように印刷したばかりの枚葉紙の外観を改善するために、印刷したばかりの枚葉紙上に液体溶液として塗布されるＵＶ硬化型又は水性分散樹脂で形成されている。このようなコーティングは、ポスター、レコードジャケット、冊子、雑誌、折畳み箱などを印刷する上で装飾又は保護用仕上げが行われる場合に、特に望ましい。

【０００５】

コーティング塗布ユニットとして印刷機の最後の印刷ユニットを使用することによってインライン印刷作業としてコーティングを施すため、さまざまな手段が講じられてきた。例えば、米国特許第４，２７０，４８３号；４，６８５，４１４号；及び４，７７９，５５７号は、印刷したばかりの枚葉紙の上にコーティング材料を塗布するのに印刷機の最後の印刷ユニットのブランケット胴を使用できるようにするために、所定の位置に移動させることのできるコーティング装置を開示している。米国特許第４，８４１，９０３号（Bird）では、最後の印刷ユニットがコーティング目的でのみ使用できるように、印刷機の最後の印刷ユニットの版胴又はブランケット胴の間を選択的に移動することのできるコーティング装置が開示されている。しかしながら、このタイプのコーティング装置が使用されているとき、最後の印刷ユニットは、枚葉紙にインキを印刷するのに使用できず

、コーティング作業のためにしか使用できない。したがって、このタイプのインラインコーティング装置でコーティングする間、最後の印刷ユニットはコーティングユニットに転換されているため、印刷機はこの印刷ユニットでの印刷能力を失う。

【０００６】

米国特許第５，１０７，７９０号（Sliker et al）のコータは、コータヘッドをブランケットシリンダ上のブランケットと係合するよう伸長させたり、引込めたりするために傾斜したレールに沿って引込めることが可能になっている。そのサイズのため、レール引込めることが可能なコータは、印刷機の最後の印刷ユニットとデリバリシートスタッカの間にのみ設置することができ、ユニット間コーティングのために使用することはできない。米国特許第４，６１５，２９３号（Jahn）のコータは、版及びゴムブランケットに対しラッカーを塗布するため、転換された印刷ユニットの湿し装置側に位置づけされた２基の別々の独立コータを提供している。その結果、版及びブランケットは具備されているものの、Jahnのコーティングユニットは専用コーティング作業のみに制限されている。

【０００７】

例えば、印刷したばかりの枚葉紙がなおも印刷機の最後の圧胴上にある間にこの枚葉紙に対してコーティング材料を塗布するように位置づけされたアプリケータローラをもつコーティング装置を開示するHoward W. DeMoore(共同発明者でかつ譲受人）に対する米国特許第５，１７６，０７７号に規定されているように、インラインコーティングが使用されている場合の印刷ユニットの損失を克服するための提案がなされてきた。こうして、最後の印刷ユニットは、同時に印刷とコーティングを行うことができ、印刷ユニットの能力の損失が結果としてもたらされることは全くない。

【０００８】

いくつかの従来のコーターはレール取付け型であり、印刷機のスペースを大きく占有し、印刷機へのアクセスを減少させている。このようなコーターを作動的コーティング位置から非作動的位置まで引込め、かくして印刷ユニットへのアクセスを減らすための精巧な装置が必要とされる。

【０００９】

したがって、印刷ユニットの損失を結果としてもたらさず、印刷機の長さを延ばさず、しかも第１の印刷ユニットを含むあらゆる石版印刷機のあらゆる石版印刷ユニット上で、版及びブランケット上に同時に水性及びフレキソ印刷用インキ及びコーティング材料を印刷・コーティングすることのできるインラインインキング／コーティング装置に対する必要性が存在する。

【００１０】

【発明が解決しようとする課題】

したがって、本発明の一般的目的は、版胴上の版に対してか又はブランケット胴上の版又はブランケットに対してインキ又はコーティング材料を選択的に塗布することのできる改良型インキング／コーティング装置を提供することにある。

【００１１】

本発明の１つの特定の目的は、版胴上の版又はブランケット胴上の版又はブランケットのいずれかとインキング／コーティング係合状態になるよう伸張できる、上述の特徴をもつ改良型インキング／コーティング装置を提供することにある。

【００１２】

本発明の関連する目的は、印刷機のあらゆる石版印刷ユニット上にとりつけることができ、しかも版胴、ブランケット胴又は隣接する印刷ユニットへのオペレータのアクセスと干渉しない上述の特徴をもつ改良型インキング／コーティング装置を提供することにある。

【００１３】

本発明のもう１つの目的は、版胴に隣接する作動的インキング／コーティング係合位置から非作動的引込み位置まで移動させることのできる上述の特徴をもつ改良型インキング／コーティング装置を提供することにある。

【００１４】

本発明のさらにもう１つの目的は、あらゆる輪転オフセット印刷機上の石版印刷、フレキソ印刷及び乾式印刷プロセスと組合わせて水性、フレキソ印刷用及びＵＶ硬化型のインキ及び／又はコーティングを塗布するために使用することので

きる、前述の特徴をもつ改良型インキング／コーティング装置を提供することにある。

【００１５】

本発明の関連する目的は、例えば第１の印刷ユニットといった１つの印刷ユニット上に水性又はフレキソ印刷用インキ又はコーティング材料を塗布し、乾式、水性、フレキソ印刷用又は石版印刷用のインキ又はコーティング材料を次の印刷ユニット上で直ちにオーバープリント又はオーバーコーティングさせることができるように次の印刷ユニット上で印刷又はコーティングする前にインキ又はコーティング材料を乾燥させることのできる、前述の特徴をもつ改良型インキング／コーティング装置を提供することにある。

【００１６】

本発明のさらにもう１つの目的は、単一の作動位置から、そして単一のインキング／コーティング装置から印刷機の印刷ユニットの版及び／又はブランケットに対して別々に及び／又は同時にインキ又はコーティング材料を塗布することのできる多色輪転オフセット印刷機上で使用するための改良型インキング／コーティング装置を提供することにある。

【００１７】

本発明の関連する目的は、インキング／コーティング装置を版からブランケットの印刷又はコーティングへと、又はその反対へと転換させる場合に印刷ユニットを調整又は変更する必要が事実上全くない、前述の特徴をもつ改良型インキング／コーティング装置を提供することにある。

【００１８】

本発明のもう１つの目的は、版胴上の版又はブランケット胴上の版又はブランケットのいずれかとインキング／コーティング係合状態となるようにあらゆる石版印刷ユニットの湿し装置のスペース内に作動的にとりつけることができ、しかも印刷ユニット間のユニット間スペース内のオペレータの移動又は活動と干渉しない改良型インキング／コーティング装置を提供することにある。

【００１９】

【課題を解決するための手段】

上述の目的は、作動的（刷り中）インキング／コーティング位置と引込んだ係合解除（非刷り中）位置の間で移動するため輪転オフセット印刷機のあらゆる印刷ユニットの湿し装置側にとりつけられる引込み式インラインインキング／コーティング装置によって達成される。インキング／コーティング装置は、版胴上の版又はブランケット胴上のブランケットと係合したり係合解除するように移動することのできるアプリケータローラを含んでいる。インキング／コーティングアプリケータヘッドは、版胴及びブランケット胴と平行に整列させた状態で印刷ユニットの従来の湿し装置スペース内で印刷機のサイドフレーム上にとりつけられるピボットピンにより印刷ユニットに対し旋回する形で結合されている。この湿し装置スペースでの取付け配置により、インキング／コーティングユニットを、印刷機上のあらゆる隣接印刷ユニットの間に設置することが可能になっている。

【００２０】

好ましい実施態様においては、アプリケータヘッドには垂直に間隔をとって設けられたクレードル部材対が含まれており、アプリケータヘッドが作動的位置にあるとそれぞれに、一方のクレードル対は版胴と心合せした状態でインキング／コーティングアプリケータローラを支持するように適合されており、もう一方のクレードル対はブランケット胴と心合せした状態でインキング／コーティングアプリケータローラを支持する。ピボットピンによって提供される旋回式支持のため、アプリケータヘッドは、印刷ユニット胴へのオペレータのアクセスを制限することなく、そして印刷ユニットがその印刷能力を損失することなく、従来の湿し装置スペース内で利用できる制限された空間の中に引込められたり伸長されたりすることができる。

【００２１】

インキング／コーティング装置をフレキソ印刷版及び水性又はフレキソ印刷用インキ又はコーティング材料と組合わせて使用する場合、印刷又はコーティングされたばかりの枚葉紙上の水性又はフレキソ印刷用インキ又はコーティング材料の水成分は、枚葉紙が次の印刷ユニット上で印刷又はコーティングを受ける前に乾燥しているように、高速高温空気式ユニット間乾燥装置及び高体積型熱・水分抽出装置アセンブリにより、蒸発及び乾燥させられる。この急速乾燥プロセスに

より、例えば不透明ホワイト又はメタリック（ゴールド、シルバー又はその他のメタリック）インキといったインキフィルム又はベース層を第１の印刷ユニット上で印刷し、次に、逆トラッピングやドットゲインなしで、次の印刷ユニット上でオーバープリントすることが可能となる。

【００２２】

本発明の構成及び作動については、本発明の原理及び利点を一例として開示する添付図面と合わせて以下の詳細な説明を考慮することによって理解できることだろう。

【００２３】

【実施例】

本明細書で使用する「処理された」という用語は、石版印刷、乾式印刷、ＵＶ硬化型、水性及びフレキソ印刷用インキ及び／又はコーティングを含む、下地材のいずれかの側に適用できる印刷及びコーティングの方法のことを言う。「下地材」という用語は、枚葉紙及び巻取紙材料を表わす。同様にここで使用されるとおり、「乾式印刷版」というのは、それぞれ親油性及び疎油性であるイメージ部域と非イメージ部域をもつ印刷版のことである。「乾式印刷用インキ」というのは、有意な水性成分を含んでいないオイルベースのインキのことである。「フレキソ印刷版」というのは、フレキソ印刷用インキ又はコーティング材料によって湿潤化できるレリーフ表面をもつ可とう性ある印刷版のことである。「フレキソ印刷用インキ又はコーティング材料」というのは、水、溶剤又はＵＶ硬化型液体の基本成分をもつインキ又はコーティング材料のことである。「ＵＶ硬化型石版印刷用インキ及びコーティング材料」というのは、紫外線の照射を受けることによって写真製版的に硬化（乾燥）され得るオイルベースの印刷用インキ及びコーティング材料のことである。「水性印刷用インキ又はコーティング材料」というのは、溶剤、希釈剤又はビヒクルとして主として水を含有するインキ又はコーティング材料のことである。「レリーフ版」というのは、くぼんだ非イメージ部域に対してもち上ったイメージ部域をもつ印刷版のことである。

【００２４】

例としての図面中に示されているように、本発明は、ここで全体として１２と

いう番号で示された枚葉紙供給型又は巻取紙供給型の輪転オフセット印刷機内で印刷される枚葉紙又は巻取紙に対して水性、フレキソ印刷用又はＵＶ硬化型のインキ又は保護及び／又は装飾的コーティングを塗布するための、ここで全体として１０という番号で示された新しい改良型インラインインキング／コーティング装置の形で実施される。この例では、図１に示されているように、インキング／コーティング装置１０は、例えばドイツのHeidelberger Druckmaschinen AGがそのHeidelberg Speedmaster SM 102(40", 102cm) という呼称で製造しているもののような、４ユニット型輪転オフセット印刷機１２の中に設置されている。

【００２５】

印刷機１２は、一方の端部、ここでは右端部で、Ｓと呼称されている枚葉紙を個々に順次印刷機の中に供給する枚葉紙フィーダ１６に結合され、そして反対側の端部では、印刷されたばかりの枚葉紙を収集し積み上げる枚葉紙デリバリスタッカ２０と結合されている、印刷機フレーム１４を含んでいる。枚葉紙フィーダ１６と枚葉紙デリバリスタッカ２０の間には、枚葉紙が印刷機１２の中を移送されるにつれてこれに４つの異なる色を印刷することのできる４つの実質的に同一の枚葉紙印刷ユニット２２、２４、２６及び２８が置かれている。印刷ユニットは、サイドフレーム部材１４、１５によって形成された印刷タワーＴ１、Ｔ２、Ｔ３及びＴ４内に収納される。各々の印刷タワーはデリバリー側２５と湿し装置側２７を有している。湿し装置スペース２９は、部分的に、印刷ユニットの湿し装置側でサイドフレームにより囲まれている。

【００２６】

例示されているとおり、印刷ユニット２２、２４、２６及び２８は実質的に同一で、従来とおりの設計のものである。第１の印刷ユニット２２には、インフィード渡し胴３０、版胴３２、ブランケット胴３４及び圧胴３６が含まれ、これらはすべて、印刷ユニットタワーＴ１、Ｔ２、Ｔ３及びＴ４を構成する印刷機サイドフレーム１４、１５の間で平行に整列した状態で回転するように支持されている。最初の３つの印刷ユニット２２、２４及び２６の各々は、印刷されたばかりの枚葉紙を隣接する圧胴から移送し、かつこれらの枚葉紙を中間トランスファドラム４０を介して次に印刷ユニットまで移送するべく配置された渡し胴３８を有

する。

【００２７】

最後の印刷ユニット２８は、デリバリシャフト４３上にとりつけられた紙取り胴４２を含む。この紙取り胴４２は、印刷されたばかりの枚葉紙１８が最後の圧胴３６から全体として４４で示されているデリバリコンベヤシステムまで移送されるにつれて、それを支持し、ここでこのデリバリコンベヤシステムは印刷されたばかりの枚葉紙を枚葉紙デリバリスタッカ２０まで移送する。移送中の汚損を防ぐため、本明細書に参考として内含されているHoward, W. DeMooreに対する米国特許第４，４０２，２６７号に記述され、請求されているように、紙取り胴４２上に可とう性のカバリングがとりつけられる。この可とう性カバリングは、米国テキサス州ダラスのPrinting Research Inc.によりその商標ＳＵＰＥＲ　ＢＬＵＥＲ で製造販売されている。場合によっては、このPrinting Research Inc.がその商標ＢＡＣＶＡＣＡ で製造販売している真空式枚葉紙移送アセンブリを、紙取り胴４２と可とう性カバリングと置き換えることもできる。

【００２８】

図２に示されているようなデリバリコンベヤシステム４４は、従来の設計のものであり、一対のエンドレスデリバリグリッパチェーン４６を含んでおり、そのうちの一方のみが、最後の印刷ユニット２８の圧胴３６と紙取り胴４２の間のニップを離れた後の印刷又はコーティングされたばかりの枚葉紙１８の前縁をつかむのに用いられるグリッパフィンガーをもつ側方に配置されたグリッパ棒をチェーンに沿った定間隔をとった場所に支持している形で、示されている。前縁がグリッパフィンガーによってつかまれると、デリバリチェーン４６は枚葉紙を最後の圧胴３６から離れるように引張り、印刷又はコーティングされたばかりの枚葉紙を枚葉紙デリバリスタッカー２０まで搬送する。

【００２９】

デリバリ枚葉紙スタッカーに到達する前に、印刷及び／又はコーティングされたシートＳは、インキ及び／又は保護／装飾用コーティングを乾燥するための赤外線熱放射、高速高温空気流及び高性能熱・水分抽出装置の組合せを含むデリバリ乾燥装置４８の下を通過する。好ましくは、高性能熱・水分抽出装置を含むデ

リバリ乾燥装置４８は、それをその商標ＡＩＲ　ＢＬＡＮＫＥＴTMの名称で製造販売する米国テキサス州ダラスのPrinting Research Inc.に対しライセンス付与された本発明の譲受人Howard W. DeMoore に共同譲渡された、Howard C. Secor, Ronald M. Rendleman及びPaul D. Copenhaverによる「赤外線強制空気乾燥装置及び抽出装置」という題の１９９３年９月３日に出願された米国特許出願番号０８／１１６，７１１号の中で記述されているとおりに作られている。

【００３０】

図３に示されている実施例では、第１の印刷ユニット２２には版胴上にとりつけられたフレキソ印刷用印刷版ＰＦがあり、したがって、インキングローラ列も湿しシステムも必要とされない。フレキソ印刷版ＰＦは第２の印刷ユニット２４の版胴上にもとりつけられる。第２の印刷ユニット２４上にとりつけられた状態で示されているインキングローラ列５２のフォームローラは、版の接触を防ぐように引込められロックされる。フレキソ印刷用インキは、インキング／コーティング装置１０により第２の印刷ユニット２４のフレキソ印刷版ＰＦに供給される。

【００３１】

米国デラウェア州ウィルミントンのE.I. du Pont de Nemours 社によって、商標ＣＹＲＥＬＲ の下で適切なフレキソ印刷版ＰＦが提供されている。もう１つの供給元としては、その商標ＮＹＬＯＦＬＥＸR の下で適切なフレキソ印刷版を提供するドイツ、Ludwingshafen のＢＡＳＦ Aktiengesellschaft がある。

【００３２】

図３及び図４に例示されているような第３の印刷ユニット２６は、石版印刷のために装備されており、インキつぼ５４から版胴３２上にとりつけられた石版印刷用版Ｐまでインキ Ｑを移送するように配置されたインキングローラ列５２を有するインキング装置５０を内含している。これは、インキ出しローラ５６及び呼出しローラ５７によって達成される。インキ出しローラ５６は、インキつぼの中へ突出し、その時点でその表面がインキを拾い上げる。石版印刷用インキＱは、インキ出しローラ５６からインキングローラ列５２まで呼出しローラ５７により移送される。インキングローラ列５２はインキＱを石版印刷版Ｐのイメージ部域

に供給する。

【００３３】

石版印刷用インキＱは石版印刷版Ｐから、ブランケット胴３４上にとりつけられているインキ受容ブランケットＢまで移送される。ブランケットＢ上に支持されているインキングされたイメージは、下地材がブランケット胴３４と圧胴３６の間のニップを通して移送されるにつれて、この下地材Ｓへと移送される。

【００３４】

図３及び図４に例示されているインキングローラ配置５２は、石版インキ印刷版Ｐと組合わせた使用についての例である。湿し液タンクＤＦをもつ湿しシステム５８が、インキングローラ列５２（図４）に結合されているものの、乾式又はフレキソ印刷には不要であることがわかる。

【００３５】

印刷ユニット２８の版胴３２には、乾式印刷版ＰＷが具備されている。乾式印刷版（Waterless printing plates)は乾式平板印刷版（dry plano-graphic printing plates)とも呼ばれ、米国特許第３，９１０，１８７号；Re. ３０６７０；４，０８６，０９３；及び4，８５３，３１３号の中で開示されている。適切な乾式印刷版は、日本国東京のToray Industries Inc. から入手できる。乾式印刷のためには湿しシステムは使用されず、乾式（オイルベースの）印刷用インキが用いられる。乾式印刷ＰＷは、それぞれ親油性／親水性及び疎油性／疎水性であるイメージ部域と非イメージ部域を有する。乾式印刷版ＰＷは彫刻又はエッチングされ、イメージ部域は非イメージ部域に対しくぼんだ状態にある。乾式印刷版ＰＷのイメージ部域は、アプリケータローラ６６により移送されるフレキソ印刷用又は水性の印刷インキで盛り換えされる。水性及びオイルベースのインキ及びコーティングは両方とも、非イメージ部域からはね返され、イメージ部域内に保持される。このとき印刷インキ又はコーティングはイメージ部域からインキ又はコーティング受容ブランケットＢへと移送され、下地材Ｓ上に印刷又はコーティングされる。

【００３６】

ある種の印刷業務のためには、例えば図５の印刷ユニット２２内で点線により

示されているように、ブランケット胴３４上のブランケットＢといったような弾力性胴貼り全体にわたり、フレキソ印刷版ＰＦ又は乾式印刷版ＰＷをとりつける。この変形態様の利点は、乾式版ＰＷ又はフレキソ印刷版ＰＦがブランケット胴上でその下にあるブランケットＢ又はその他の弾力性胴貼りによって、弾力性ある状態で支持されるという点にある。弾力性ブランケットＢの半径方向のたわみ及び順応性は、アプリケータローラ６６とフレキソ印刷版又は乾式版の間に、均質な確動係合を提供する。

【００３７】

この配置において、版は版胴３２の上にとりつけられておらず、その代り、乾式版ＰＷがブランケット胴上にとりつけられ、乾式印刷版上のインキングされたイメージは裏移りせず、その代り乾式版ＰＷから下地材Ｓまで直接移送される。印刷されたばかりの枚葉紙上のフレキソ印刷インキの水成分は、印刷されたばかりの水性又はフレキソ印刷インキが次の印刷ユニット上での下地材の印刷の前に乾燥させられるように、高速、高温空気乾燥装置及び高体積熱・水分抽出装置により蒸発させられる。

【００３８】

ここで図２、図３及び図９を参照すると、インキング／コーティング装置１０は、Ｘ軸を中心にした回転のためサイドフレーム１４、１５上に旋回する形でとりつけられている。インキング／コーティング装置１０は、フレーム６０、油圧モータ６２、下部歯車列６４、上部歯車列６５、アプリケータローラ６６、密封型ドクターブレードアセンブリ６８（図６）及びしずく受けＤＰを含み、これらはすべてフレーム６０上にとりつけられている。アプリケータローラ６６の外周表面は、タンク７０の中に入った液体コーティング材料又はインキとの接触により湿潤化される。

【００３９】

油圧モータ６２は、印刷機駆動装置（図示せず）からのＲＰＭ制御信号及び回転速度計７２が発生させたフィードバック信号に応答して、版胴３２及びブランケット胴３４と同期的にアプリケータローラ６６を駆動する。油圧駆動式モータが好ましいが、電気駆動式モータ又はそれと同等のものといったその他の駆動手

段を使用することもできる。

【００４０】

乾式印刷版システムを用いる場合、乾式印刷用インキ及び乾式印刷用版の温度は、優れたイメージ再生を得るよう精密に制御されなくてはならない。例えば、ＴＯＲＡＹ乾式印刷用版ＰＷでの乾式オフセット印刷のためには、乾式印刷版表面及び乾式インキの温度を例えば２４℃（７５°F)～２７℃（８０°F)といった非常に狭い範囲に制御することが絶対に必要である。

【００４１】

ここで図７を参照すると、タンク７０には、熱交換器７１により温度制御されているインキ又はコーティングが供給される。温度制御されたインキ又はコーティング材料は、例えばぜん動ポンプといった容積式ポンプにより、タンク７０及び熱交換器７１を通って供給源７３から供給導管及び戻り導管７７まで、循環させられる。熱交換器７１は、インキ又はコーティング材料を冷却又は加熱し、インキ又はコーティング及び印刷版を望ましい狭い温度範囲内に維持する。

【００４２】

本発明の１つの態様に従うと、水性／フレキソ印刷用インキ又はコーティング材料は、乾式印刷版又はフレキソ印刷版であってよい印刷版（図７）まで水性／フレキソ印刷用インキ又はコーティング材料を移送するアプリケータローラ６６へと供給される。乾式印刷版ＰＷに対して水性／フレキソ印刷用インキ又はコーティング材料を塗布するのにインキング／コーティング装置が使用される場合、インキングローラ列５２は必要とされず、印刷版から離れるように引込められる。水性／フレキソ印刷用インキ又はコーティング材料の粘度は温度と共に変動するため、好ましい運転範囲内にインキの粘度を維持するように大気温度の変動を補償するため水性／フレキソ印刷用インキ又はコーティング材料を加熱又は冷却することが必要である。

【００４３】

例えば、印刷機の温度は、午前中の６０°F(１５℃）前後から午後の約８５°F(２９℃）以上まで変動し得る。水性／フレキソ印刷用インキ又はコーティング材料の粘度は、印刷機の大気温度が６０°F(１５℃）に近い場合、わずかに高い

可能性があり、この粘度は、印刷機の周囲温度が８５°F(２９℃）を上回る場合、わずかに低い可能性がある。したがって、乾式印刷版の表面温度を規定の温度範囲内に維持するように水性／フレキソ印刷用インキ又はコーティング材料の温度を制御することが望ましい。さらに、フレキソ印刷プロセスと関連してインキ又はコーティング材料が使用されている場合、望ましい範囲内に水性／フレキソ印刷用インキ又はコーティング材料のタックを維持するように、インキ／コーティング材料の温度を制御すべきである。

【００４４】

アプリケータローラ６６は好ましくは、版又はブランケットに対し測定された量の印刷用インキ又はコーティング材料を移送するアニロックス流体計量ローラである。アニロックスローラの表面には、「セル」と呼ばれる密な間隔をとって設けられた浅いくぼみのアレイが彫刻されている。タンク７０からのインキ又はコーティングは、タンクを通してアニロックスローラが回転するにつれてセルの中へ流れ込む。アニロックスローラの移送表面は、余剰のインキ又はコーティング材料を除去するためにデュアルドクターブレード６８Ａ、６８Ｂで「ドクタリング」（拭うか又はかき落とす）される。アニロックスローラによって計量されるインキ又はコーティングは、セルの中に収納されたものである。デュアルドクターブレード６８Ａ、６８Ｂは同様に、供給物タンク７０も密封している。

【００４５】

アニロックスアプリケータローラ６６は円筒形であり、さまざまなサイズ及び形状のセルを含み、さまざまな直径及び長さで製造することができる。アニロックスローラの体積容量は、セルのサイズ、形状及び単位面積あたりの数によって決定される。意図されている利用分野に応じて、セルパターンは細かくてもよいし（単位面積あたり数多くの小さいセル）、粗くてもよい（単位面積あたり少なめの大きいセル）。

【００４６】

インキング／コーティング装置１０を通してインキ又はコーティング材料を供給することによって、石版印刷ユニットのインキングローラ列に比べ、枚葉紙Ｓに対しより多くのインキ又はコーティング材料を塗布することができる。その上

、水性又はフレキソ印刷用インキ又はコーティング材料は石版印刷プロセスにより塗布できるものよりもはるかに大きいフィルム厚又は重量で塗布でき、水性又はフレキソ印刷用カラーは湿し溶液によって希釈されないため、色の強度はより強く、よりあざやかである。

【００４７】

好ましくは、密封されたドクターブレードアセンブリ６８は、本明細書に参考として内含されている、共同発明者であり譲受人であるHoward W. DeMoore に対する米国特許第５，１７６，０７７号の中で記述されているとおりに製造される。密封されたタンクを使用する利点は、急速乾燥インキ又はコーティング材料を使用することができるということにある。急速乾燥インキ又はコーティング材料は、開放型インキつぼ５３（図８参照）内で使用できる；しかしながら、外気への露呈により急速乾燥インキ又はコーティング材料中の水及び溶剤がさらに速く蒸発することになり、かくしてインキ又はコーティング材料は時期早尚に乾燥し、粘度が変わることになる。その上、開放型インキつぼは、印刷室に望ましくない臭気を発出する。密封されたドクターブレードアセンブリが利用される場合、インキ又はコーティング材料をドクターブレードヘッドまで循環させるポンプ（図７）は好ましくはぜん動ポンプであり、このポンプは、インキ又はコーティングタンク７０に供給するフィーダライン内に空気を射出せず、インキ又はコーティング材料内で気泡及び泡が形成しないよう補助する。

【００４８】

代替的なアプリケータローラ配置をもつインキング／コーティング装置１０が図１０～１３内に例示されている。この配置において、アニロックスアプリケータローラ６６、６７の彫刻された計量表面は、第１の彫刻された周辺表面部分６６Ａを第２の彫刻された周辺表面部分６６Ｂから分離する平滑なシール表面６６Ｃによって仕切られている。同様にして、ドクターブレードタンクのエンドシール１３４、１３６（図１２）を係合するためアプリケータローラ６６の反対側の端部部分上に、平滑なシール表面６６Ｄ、６６Ｅが形成されている。上部アプリケータローラ６７は、平滑なシールバンド６７Ｃによって分離されている彫刻されたアニロックス計量表面６７Ａ及び６７Ｂを有する。

【００４９】

ここで図１２及び図１３を参照すると、ドクターブレードヘッド６８のタンク７０は、２つの別々のチャンバ７０Ａ、７０Ｂを形成するために湾曲したシール要素により仕切られている。シール要素１３０は、環状溝１３２の中でドクターブレードヘッドに固定される。シール要素１３０は、好ましくはポリウレタンフォーム又はその他の耐久性及び弾力性のある発泡材料で作られる。シール要素１３０は、シールバンド６６によって係合され、かくして、１つのタンクチャンバからその他のタンクチャンバへとインキ又はコーティング材料が漏出するのを阻止するロータリシールを形成している。その上シールバンドは、印刷又はコーティングされた部域を互いから分離する印刷又はコーティングされていない部域を提供し、これは略掛け印刷又は同じ下地材に複数の別々のイメージを印刷するその他の印刷業務にとって必要なことである。

【００５０】

分割アプリケータローラの実施態様がもつもう１つの利点は、それにより複数のフレキソ印刷用インキ又はコーティング材料を同じ石版印刷ユニット内で同時に印刷することができる、という点にある。すなわち、上部ドクターブレードアセンブリのタンクチャンバ７０Ａ、７０Ｂには例えばゴールドインキとシルバーインキを供給し、その一方で下部ドクターブレードアセンブリのタンクチャンバ７０Ａ、７０Ｂには例えば不透明のホワイトインキ及びブルーインキといった２つの付加的なカラーのインキを供給することができる。こうして、いずれかの石版印刷機上の同じ印刷ユニット上で、不透明のホワイトインキにゴールドインキでオーバープリントし、ブルーインキにシルバーインキでオーバープリントすることが可能となる。

【００５１】

その上、上部ドクターブレードタンク内で触媒を使用することができ、下部ドクターブレードタンク内で反応性インキ又はコーティング材料を使用することができる。こうして、例えば改善された化学的耐性及びより高い光沢レベルといったさまざまな効果が得られる。

【００５２】

上部クレードル位置にある分割型アプリケータローラ区分６７Ａ、６７Ｂは、版の別々の表面部域に対して例えばフレキソ印刷用、水性及びＵＶ硬化型インキ又はコーティング材料といった２つの別々のインキ又はコーティング材料を同時に塗布するために使用できるのに対し、下部アプリケータローラ区分６６Ａ、６６Ｂは、別々のブランケット表面部域に対して同時に重合開始剤層及び微細包埋層を塗布することができる。場合によっては、計量用表面部分６６Ａ、６６Ｂには同時に印刷されつつある異なる印刷効果を提供するための異なるセル計量能力が備わっていてよい。例えば、アニロックスアプリケータローラの１つの半区分の上のスクリーンライン計数は、ハーフトーンイメージについて好ましくは１インチあたり２００～６００ライン（１cmあたり７９～２３６ライン）の範囲内にあり、その他の半区分のスクリーンライン計数は、不透明ホワイトといったような全面網羅の高重量の利用分野について、好ましくは１インチあたり１００～３００ライン（１cmあたり３９～１１８ライン）の範囲内にある。デュアルアプリケータローラと組合わせたこの分割型配置は「略掛け」印刷業務に関連して使用された場合に特に有利である。

【００５３】

再び図８を参照すると、図６に示されているような密封されたドクターブレードタンクアセンブリ６８を使用する代りに、液体インキＱ又はコーティング材料を一定体積収納するインキ出しパン５３によって、開放型インキ出しアセンブリ６９が提供されている。液体インキ又はコーティング材料は、インキ出しパン内のインキＱ又はコーティング材料と接触して回転するパンローラ５５によりアプリケータローラ６６に移送される。分割型アプリケータローラが使用されるならば、パンローラ５５も同様に分割され、パンは図１６に示されているように、分離板５３Ｐにより２つのパン区分５３Ａ、５３Ｂに分割される。

【００５４】

図１６の代替的実施態様においては、パンローラ５５は中央にある環状溝５９により２つのパンローラ区分５５Ａ、５５Ｂに分けられる。分離板５３Ｐは溝５９の中に収容され、この溝と中央で心合せされるが、隣接するローラ面には接触しない。この配置により、複数のインキ又はコーティング材料Ｑ１、Ｑ２が、そ

れぞれ分割されたパンローラ区分５３Ａ、５３Ｂによる移送のため開放パン区分５５Ａ、５５Ｂ内に収納される。こうして、同じ印刷ユニットのブランケット上又は版上の２つの別々のイメージ部域に対して複数のフレキソ印刷用インク又はコーティング材料を移送することが可能となる。この配置は、略掛け印刷業務又は同じ下地材上に複数の別々のイメージを印刷するその他の印刷仕事のために、特に有利である。

【００５５】

インキング／コーティング装置１０のフレーム６０は、アプリケータローラ６６、歯車列６４、歯車列６５、ドクターブレードアセンブリ６８及び駆動モータ６２を支持するサイド支持部材７４、７６を含む。アプリケータローラ６６は、ソケット７９、８１及びリテーナキャップ１０１、１０３をもつ一対のサイド支持部材７８、８０により形成された下部クレードルアセンブリ１００上で反対側の端部に支持されているスタブシャフト６３Ａ、６３Ｂ上にとりつけられている。このスタブシャフトは、長手方向軸Ａ１（上部クレードル内の軸Ａ２）を中心にしたアプリケータローラ６６の自由な回転を可能にする転がり軸受１０５、１０７の中に収容される。リテーナキャップ１０１、１０３は、スタブシャフト６３Ａ、６３Ｂ及び軸受１０５、１０７をソケット７９、８１内に保持し、旋回軸Ｘと平行に整列させられた状態にアプリケーションローラ６６を保持する。

【００５６】

サイド支持部材７４、７６も同様に、下部側板７８、８０に対して垂直に間隔をとって配置されている１対のサイド支持部材８２、８４によって形成される上部クレードルアセンブリ１０２を有している。各々のクレードル１００、１０２は、版胴３２（図４）上の印刷版Ｐ又はブランケット胴３４上の印刷版Ｐ又はブランケットとスポットコーティング又はインキング係合状態になるようにアプリケータローラ６６、６７を保持するためにそれぞれ一対のソケット７９、８１及び８３、８５を有する。

【００５７】

好ましくは、上部クレードル（版）位置にあるアプリケータローラ６７（図８、図９）は、弾力性の移送表面をもつアニロックスローラである。図２に示され

ているようなデュアルクレードル配置では、印刷機のオペレータはブランケットインキング／コーティングから版インキング／コーティングへと数分で急速交換することができる。これは、アプリケータローラ６６を解放し、除去し、そして再度位置づけするか又は交換することしか必要でないからである。

【００５８】

同じ石版印刷機の異なる印刷ユニット上でフレキソ印刷モード、水性モード、乾式モード又は石版印刷モードで同時に印刷する能力及び印刷ユニットのうちのいずれか１つの上で版の位置又はブランケットの位置のいずれかから印刷又はコーティングする能力を、ここでは、ＬＩＴＨＯＦＬＥXTM印刷プロセス又はシステムと呼んでいる。ＬＩＴＨＯＦＬＥXTMは、本発明の独占実施権者である米国テキサス州ダラスのPrinting Research Inc.の商標である。

【００５９】

ここで図１４を参照すると、代替的設計のインキング／コーティングアセンブリ１０９を有するインキング／コーティング装置１０が、版胴３２上の版Ｐに対してインキ及び／又はコーティング材料を塗布するため、上部クレードル位置に設置されている。この変形実施態様に従うと、弾力性移送表面をもつアプリケータローラ６７Ｒが、測定された量の印刷インキ又はコーティング材料を版Ｐまで移送するアニロックス流体計量ローラに結合されている。アニロックスローラ１１１は、セルが彫刻されている、金属、セラミックス又は複合材料でできた移送表面をもつ。弾力性アプリケータローラ６７Ｒは、アニロックスローラ１１１の計量表面及び版Ｐと移送係合状態で、介在させられている。アプリケータローラ６７Ｒの弾力性移送表面は、版と均等な確動係合を提供する。

【００６０】

ここで図１７を参照すると、ブランケット胴３４上にとりつけられた版又はブランケットに対しフレキソ印刷用又は水性インキ及び／又はコーティング材料Ｑを塗布するため下部クレードルアセンブリ１００内に、代替的なインキング／コーティングアセンブリ１１３をもつインキング／コーティング装置１０が設置される。図６に示されているような密封型デュアルドクターブレードタンクアセンブリ６８を使用する代りに、開放型単一ドクターブレードアニロックスローラア

センブリ１１３に、開放型インキ出しパン１１７内に収納された液体インキＱ又はコーティング材料が供給される。液体インキ又はコーティング材料Ｑは、アニロックスローラ６６がインキ出しパン１１７内で回転するにつれてその彫刻された移送表面に対して移送される。余剰のインキ又はコーティング材料Ｑは、単一のドクターブレード６８Ｂにより彫刻された移送表面から除去される。液体インキ又はコーティング材料Ｑは、例えば図１７に示されているドラム７３といった印刷機外の供給源から供給導管１１９を通ってインキ出しパン１１７までポンプ１２０により圧送される。

【００６１】

全体的なインキング又はコーティング業務のために、アニロックスローラ６６の計量用移送表面はその周辺表面全体にわたり広がっている。しかしながら、例えば略掛け印刷業務といった同じ下地材上に複数の別々のイメージを印刷するいくつかの印刷業務については、アニロックスアプリケータローラ６６の計量用移送表面は、図１１及び図１８に示されているように第１及び第２の計量用移送表面６６Ａ、６６Ｂを分離する中央にある環状アンダーカット溝６６Ｃによって仕切られている。

【００６２】

単一のドクターブレード６８Ｂは、分割された計量用移送表面６６Ａ、６６Ｂに対して同時に拭う１つの縁部６８Ｅを有する。この単一ブレードでは、例えばドラム７３Ａ、７３Ｂ、デュアル供給ライン１１９Ａ、１１９Ｂ、及びデュアルポンプ１２０Ａ、１２０Ｂといったデュアル供給源を提供するのに、分割型アニロックスローラの実施態様１１３が必要である。さらにインキ出しパン１１７も分割され、パン１１７は、図１８に示されているように分離板１２１によって２つのパン区分１１７Ａ、１１７Ｂに分けられている。この分離板１２１は、アンダカット溝６６Ｃと中央で心合せされているが、隣接するローラ面には接触しない。

【００６３】

単一ブレードの分割型アニロックスアプリケータローラアセンブリ１１３は、下部クレードル位置にとりつけられた状態で示されているが（図１７）、単一ブ

レードの分割型アニロックスアプリケータローラアセンブリ１１３を上部クレードル位置でとりつけ、ここで使用することも同様に可能である。

【００６４】

本発明のもう１つの態様に従うと、インキング／コーティング装置１０は、単一ヘッドのデュアルクレードルインキング／コーティング装置１０をあらゆる石版印刷ユニット上にとりつけることができるようにする水平ピボットピン８８Ｐ、９０Ｐ上に旋回する形で結合されている。ここで図９を参照すると、水平ピボットピン８８Ｐ、９０Ｐは印刷ユニットの従来の湿し装置スペース２９内にとりつけられ、それぞれ印刷機サイドフレーム１４、１５に固定されている。好ましくは、ピボット支持ピン８８Ｐ、９０Ｐは、ネジ部品により印刷機サイドフレームに固定される。ピボット支持ピンはインキング／コーティング装置１０のサイド支持部材７４、７６を交叉する円形開口部８８、９０内に収容される。水平支持ピン８８Ｐ、９０Ｐは、回転軸Ｘ及び版胴及びブランケット胴を平行に整列した状態で配置され、互いに長手方向に整列させられている。

【００６５】

好ましくは、ピボットピン８８Ｐ、９０Ｐは、アプリケータローラ６６、６７の回転軸Ａ１、Ａ２がニップ接触点Ｎ１、Ｎ２との関係において高くなるように、湿し装置スペース２９の中に位置づけされている。この配置により、アプリケータローラ６６とブランケットシリンダ３４上のブランケットの間の移送点（図８に示されている）及びアプリケータローラ６６と版胴３２上の版の間の移送点（図５に示されている）は、それぞれ版胴及びブランケット胴の半径ラインＲ１、Ｒ２より上にある。こうしてインキング／コーティング装置１０は、パワーアクチュエータアーム１０４Ａ、１０６Ａの単一伸長ストロークに応えてブランケット胴との関係における非刷り中位置までアプリケータローラ６６を引込めるべく時計まわりに移動することが可能となる。同様にして、アプリケータローラ６６は、それぞれアクチュエータアーム１０４Ａ、１０６Ａの単一の引込みストロークにより図４、５、６及び８に示されているとおりの刷り中作動的位置まで反時計まわりに移動させられる。

【００６６】

好ましくは、ピボットピンは鋼で作られ、サイド支持部材はアルミニウムでできており、円形開口部８８、９０を縁どるアルミニウムのカラー部分及び鋼製ピボットピンが低摩擦ジャーナルを形成する。この配置により、インキング／コーティング装置１０はピボットピン８８Ｐ、９０Ｐとの関係において時計回り及び反時計回りに自由に回転することができる。標準的には、回転の弧長は約５０ミル（約１．５㎜）である。したがって、インキング／コーティング装置１０は、刷り中の位置及び非刷り中位置において印刷ユニットの湿し装置スペース２９内にほぼ完全に閉じ込められている。

【００６７】

クレードルアセンブリ１００及び１０２は、インキング／コーティング装置１０が作動的（刷り中）位置まで伸長された時点でそれぞれ版胴又はブランケット胴とインキング／コーティング心合せ状態に、アプリケータローラ６６を位置づけする。その上、インキング／コーティング装置１０は湿し装置２９内に設置されているため、この装置１０は、印刷機サイドフレーム又は印刷機のその他の部品により妨害されることなく伸長及び引込み中に小さな弧全体を通して自由に回転することができる。このため、あらゆる石版印刷ユニット上にインキング／コーティング装置１０を設置することが可能となる。さらに、湿し装置スペース２９内のその内部取りつけ位置のため、インキング／コーティング装置１０の印刷ユニット間のスペース内への突出は最小限である。こうして、アプリケータヘッドが作動的（刷り中）位置及び引込み（非刷り中）位置にある場合に、オペレータは制約なく印刷ユニットにアクセスすることができる。

【００６８】

図４及び図５に示されているように、インキング／コーティング装置１０の動きは、引込み（非刷り中）位置から作動的（刷り中）位置まで反時計回りである。

【００６９】

湿し装置側の設置が好ましいものであるが、インキング／コーティング装置１０は、印刷ユニットのデリバリ側で作動するように適合させることができ、ここで、このインキング／コーティング装置は、印刷ユニットのデリバリ側２５でブ

ランケット胴上のブランケット又は版胴上の版のいずれかとアプリケータローラを係合させるため、引込み（非刷り中）位置から刷り中位置まで移動可能である。

【００７０】

作動的（刷り中）位置までのインキング／コーティング装置１０の動きは、パワーアクチュエータ、好ましくはそれぞれ伸長／引込み可能なパワートランスファアーム１０４Ａ、１０６Ａをもつ複動型空気圧シリンダ１０４、１０６によって生成される。第１の空気圧シリンダ１０４は、ピボットピン１０８により印刷機フレーム１４に旋回する形で結合され、第２の空気圧シリンダ１０６はピボットピン１１０により印刷機フレーム１５に旋回する形で結合されている。空気圧シリンダ１０４、１０６の選択的起動に応えて、パワートランスファアーム１０４Ａ、１０６Ａは伸長するか又は引込められる。パワートランスファアーム１０４Ａは、ピボットピン１１２によりサイド支持部材７４に旋回する形で結合される。同様にして、パワートランスファアーム１０６Ａはピボットピン１１４によりサイド支持部材７６に旋回する形で結合されている。

【００７１】

パワーアームが伸長するにつれて、インキング／コーティング装置１０はピボットピン８８Ｐ、９０Ｐ上で時計回りに回転させられ、かくしてアプリケータローラ６６を、非刷り中位置まで移動させる。パワーアームが引込むにつれて、インキング／コーター装置６０はピボットピン８８Ｐ、９０Ｐの上を反時計回りに回転させられ、かくしてアプリケータローラ６６を刷り中位置まで移動させる。空気圧アクチュエータにより加えられたトルクはピボットピン１１２及びピボットピン１１４を通してインキング／コーティング装置まで伝達される。

【００７２】

調整可能なストッパアセンブリ１１５により、版胴又はブランケット胴との関係におけるアプリケータローラの刷り中位置及びローラ係合圧力の微調整が提供される。調整可能なストッパアセンブリ１１５は、ベルクランク１１８と係合可能なねじ込みボルト１１６を有する。ベルクランク１１８は、ピン１２０上のサイド支持部材７４に対して旋回する形で結合されている。ベルクランク１１８の

片端はねじ込みボルト１１６により係合可能であり、カムローラ１２２がその反対側端部で回転するようにとりつけられている。係合衝撃点は、アプリケータローラ６６が版Ｐ又はブランケットＢとインキング／コーティング係合するよう適切に位置づけられ、インキング／コーティングアセンブリ６０が作動的位置まで移動された時点で望ましい量のインキング／コーティング圧力を提供するように、ボルト１１６の回転によって調整される。

【００７３】

この配置により、インラインインキング／コーティング装置は、隣接するどの印刷ユニットの間のユニット間スペースも侵害することなく、しかもインキング／コーティング装置が伸長（非刷り中）位置又は引込み（刷り中）位置にある場合に印刷ユニットの各胴へのアクセスを阻止したり妨害することなく、有効に作動することができる。その上、インラインインキング／コーティング装置が引込み位置にある場合、ドクターブレードタンク及びコーティング循環ラインは、印刷機が作動している間ならびに１つの業務からもう１つの業務へ又は１つのタイプのインキ又はコーティングからもう１つのタイプのものへと交換するために印刷機が停止させられた時点で、自動的にドレーン及びフラッシングされ得る。

【００７４】

水性フレキソ印刷インキで印刷又はコーティングされる下地材には、乾燥のために高速高温空気が必要である。不透明ホワイト又はメタリックゴールドといったフレキソ印刷用インキを印刷する場合には、オーバープリンティングの前に、印刷ユニット間で印刷済み下地材を乾燥させることがつねに必要である。本発明によると、印刷又はコーティングされたばかりの下地材Ｓの表面上の水成分は、図２、図４及び図５で示されているように、高速の高温空気ユニット間乾燥装置及び高体積熱・水分抽出装置ユニット１２４、１２６及び１２８によって蒸発及び乾燥させられる。乾燥装置／抽出装置ユニット１２４、１２６及び１２８は、１つの印刷ユニットの圧胴３６及び中間トランスファドラム４０によりもう１つの渡し胴３０及び次の印刷ユニットの圧胴３６まで、印刷／コーティングされたばかりの下地材が移送されるにつれて、この下地材上に高速加熱空気を導くように方向づけされている。この配置により、印刷されたばかりのフレキソ印刷イン

キ又はコーティング材料は、下地材Ｓが次の印刷ユニットによってオーバープリントされる前に乾燥させられる。

【００７５】

高速の高温空気乾燥装置及び高性能熱・水分抽出装置ユニット１２４、１２６及び１２８は、印刷又はコーティングされたばかりの各々の枚葉紙又は巻取紙の表面に付着する湿った空気層をこすり、分散させる高速エアジェットを利用する。各乾燥装置の中で、高速空気は、空気送り出しバッフル管内の抵抗加熱要素を横断して流れるにつれて加熱される。高温空気の高速ジェットは、多数の空気流アパーチャを通して露呈ゾーンＺ（図４及び図５）内に放出され、それぞれ圧胴３６及びトランスファドラム４０により移送されている印刷／コーティングされたばかりの枚葉紙Ｓ上に放出される。

【００７６】

各々の乾燥装置アセンブリには、間隔をとって並んだ形で配置されている一対の空気送り出し乾燥装置ヘッド１２４Ｄ、１２６Ｄ及び１２８Ｄが含まれている。高速、高温空気乾燥装置及び高性能熱・水分抽出装置ユニット１２４、１２６及び１２８は、好ましくは、本明細書に参考として内含され米国テキサス州ダラスのPrinting Research Inc.によりその商標ＳＵＰＥＲ　ＢＬＵＥ　ＨＶTMで市販されている、本発明の共同発明者であり譲受人であるHoward W. DeMoore に対する「高速高温空気乾燥装置」という題の、１９９３年１０月６日に提出された同時係属米国特許出願第０８／１３２，５８４号の中で開示されているとおりに製造される。

【００７７】

印刷又はコーティングされた各枚葉紙の表面から移動させられた水分を含む高温空気は、高体積抽出装置１２４、１２６及び１２８により、乾燥装置露呈ゾーンＺから抽出され、印刷ユニットから排出される。各々の抽出装置ヘッドは、乾燥装置ヘッド１２４Ｄ、１２６Ｄ及び１２８Ｄに結合された抽出装置マニホルド１２４Ｅ、１２６Ｅ及び１２８Ｅを含み、乾燥装置ヘッドの間の長手方向空隙Ｇを通して水分、揮発分、臭気及び高温空気をひき抜く。抽出が乾燥と同時に行われる場合に、最高の結果が得られる。好ましくは、図４に示されているように、

各乾燥装置の場所で、露呈ゾーンＺに対し抽出装置が密に結合されている。抽出装置ヘッド１２４Ｅ、１２６Ｅ及び１２８Ｅは、長手方向抽出装置空隙Ｇが露呈ゾーンＺ内に直接面している状態で、それぞれ乾燥装置ヘッド１２４Ｄ、１２６Ｄ、１２８Ｅ上にとりつけられている。この配置に従うと、各々の印刷又はコーティング済み枚葉紙は、次の印刷ユニット上で印刷される前に乾燥される。

【００７８】

ユニット間高速高温空気乾燥装置／抽出装置１２４、１２６及び１２８によって提供される比較的穏やかな温度で、フレキソ印刷で使用される水性の水ベースインキは蒸発する。フレキソ印刷用インキ又はコーティング材料は、次の印刷ユニット上でオーバープリントされる前に乾燥されるため、鮮明度及び印刷の質は実質的に改善される。印刷されたばかりのフレキソ印刷用インキは乾燥しているため、ドットゲインは実質的に低減し、次の印刷ユニットのブランケット上の逆トラッピングは事実上削除される。このユニット間乾燥／抽出配置により、第１の印刷ユニット上でメタリックインキ及び不透明のホワイトインキといったフレキソ印刷用インキを印刷し、次に第２以降の印刷ユニット上でドライトラッピング及びオーバープリンティングすることが可能となる。

【００７９】

その上、この配置により、リント、塵埃、噴霧粉末及びその他の砕片をトラッピングして密封し、次の印刷ユニットでオーバープリントできる、より平滑でより耐性のある印刷表面を提供するべく、再生紙、厚紙、プラスチックなどのような最もグレードの低い下地材に対してフレキソ印刷用、水性又はＵＶ硬化型のコーティング材料が塗布されるコーターとして、第１の印刷ユニット２２を使用することが可能となる。

【００８０】

最初の下位（下塗り）水性コーティング層が、例えば再生紙やプラスチックといったような低級の粗い下地材の表面を密封し、オーバープリントされたドットの精細度を改善し、ストライクスルー（裏板４）及びショースルー（透き通し）を防ぎながらより良好なインキの付きを提供する。このとき、下塗り全体にわたり下流にフレキソ印刷用ＵＶ硬化型コーティング材料を塗布し、かくしてより高

いコーティングの光沢を生み出すことができる。

【００８１】

好ましくは、アプリケータローラ６６は、ブランケット胴３４上のブランケットＢ又はその他の弾力性材料にインキ又はコーティング材料を塗布するのに使用される場合、複合炭素繊維材料、金属又はセラミックスコーティングされた金属で作られている。アプリケータローラ６６が胴に適用される場合、これは好ましくは、弾力性の圧縮性移送表面をもつアニロックスローラとして構成される。適切な弾力性ローラ表面材料としては、BunaN合成ゴム及びＥＰＤＭ（ターポリマーエラストマー）が含まれる。

【００８２】

プロトタイプテストにおいて、インキング／コーティング装置１０が、蛍光物（Day Glo）、パール、メタリック（ゴールド、シルバー及びその他のメタル）、光る物、ひっかくと芳香が出るもの（スクラッチアンドスニフ）（微細包埋フラグランス）、ひっかくと何かが現われ出る物（スクラッチアンドリビール）、発光物、感圧接着剤など、ならびにＵＶ硬化型及び水性コーティングといったものを含む広範囲にわたるインキ及びコーティングタイプを塗布できるということが実証されてきた。

【００８３】

湿し装置アセンブリを印刷ユニットからとり外した状態で、フレキソ印刷用インキ及び／又はコーティングをフレキソ印刷用又は乾式印刷用版又はブランケットに対して選択的に塗布するため、湿し装置スペース内にインキング／コーティング装置１０を容易に設置することができる。さらに、フレキソ印刷用インキ及び／又はコーティングは本発明の高速・高温空気ユニット間乾燥装置及び高体積熱・水分抽出装置アセンブリによって乾燥させられるため、次の印刷ユニット上でフレキソ印刷用インキ及びコーティングのオーバープリンティングを行うことができる。

【００８４】

本発明で使用されるようなフレキソ印刷用インキ及びコーティングは、カラー顔料及び／又は可溶性染料、顔料を下地材表面上に固定するバインダ、ワックス

、脱泡剤、増粘剤及び溶剤を含有する。水性印刷用インキは、希釈剤及び／又はビヒクルとして主として水を含有している。好ましい増粘剤には、アルゴネート、でんぷん、セルロース及びその誘導体、例えばセルロースエステル又はセルロースエーテルなどが含まれる。有機及び無機顔料を含む着色剤を、水及び溶剤中で溶けない染料から誘導することができる。適切なバインダとしては、アクリル酸エステル及び／又はポリ塩化ビニルが含まれる。

【００８５】

メタリックインキが印刷される場合、アニロックスローラのセルは、金属粒子がセル内に粘着した状態となるのを防ぐように適切にサイズ決定されてなくてはならない。例えば、メタリックゴールドインキについては、アニロックスローラは、１インチあたり１７５～３００ライン（１cmあたり６８～１１８ライン）の範囲内のスクリーンライン計数を有していなくてはならない。好ましくは、アニロックスローラセルを開けた状態に保つため、ドクターブレードアセンブリ６８には、本明細書に参考として内含されている、Howard W. DeMoore に対し譲渡され、米国テキサス州ダラスのPrinting Research Inc.にライセンス付与された、Steven M. Personに対する米国特許第５，４２５，８０９号の中で記載されているとおりの剛毛ブラシＢＲ（図１４）が具備されている。

【００８６】

インキング／コーティング装置１０は同様にＵＶ硬化型インキ及びコーティングを塗布することもできる。ＵＶ硬化型インキ及びコーティングが利用される場合、高速高温空気乾燥装置／抽出装置ユニット１２４、１２６及び１２８のそれぞれに隣接して、紫外線乾燥装置／抽出装置が設置される。

【００８７】

本明細書に記述されているＬＩＴＨＯＦＬＥＸTM印刷プロセスが、石版印刷モードで印刷機の印刷ユニットを選択的に作動させるがその一方で、同時に同じ印刷機のもう１つの印刷ユニットをフレキソ印刷モード又は乾式印刷モードのいずれかで作動させ、さらに一方で、版位置又はブランケット位置のいずれかから別々に又は同時に印刷又はコーティングするケイパビリティを提供することを可能にするものであるということがわかるだろう。本発明のデュアルクレードル支持

配置は、インキング／コーティング装置１０が引込み位置にある間にアプリケータローラ６６を除去し、再度位置づけするか又は交換することしか必要でないため最低の印刷機動作不能時間で、ブランケット胴上でのインキング／コーティング位置から版胴上でのインキング／コーティング位置まで迅速に切替えることを可能にする。４つの押えネジをとり外し、クレードルからアプリケータローラ６６をもち上げ、それをその他のクレードル内に再度位置づけすることしか必要でない。これはすべて、印刷機からインキング／コーティング装置１０をとり外すことなく、数分で達成できる。

【００８８】

同じ印刷機の作動中、１つの印刷ユニット上でフレキシ印刷用インキ又はコーティングを用いて版位置又はブランケット位置からスポットコーティング又は全体コーティングし、次にもう１つの印刷ユニット上で版位置又はブランケット位置からＵＶ硬化型インキ又はコーティングでスポットコーティング又は全体コーティングすることが可能である。その上、印刷機オペレータは１つの業務のため版からスポット又は全体コーティングし、その後次の業務でブランケットからスポット及び／又は全体コーティングすることができる。

【００８９】

版又はブランケットに対するアプリケータローラの位置づけは、予め定められ、予めセットされた作動的位置まで反復可能である。したがって、ＬＩＴＨＯＦＬＥＸTMプロセスのためにはわずかな印刷ユニットの修正又は変更しか必要でないかもしれない。実施例に関連して自動伸長及び引込みについて記述してきたが、作動的（刷り中）位置への伸長及び非作動的（非刷り中）位置への引込みは、所望の場合手でも行うことができる。手動の態様においては、作動的（刷り中）位置で印刷機サイドフレーム１４、１５に対してインキング／コーティング装置１０をラッチし、非刷り中（引込み）位置でインキング／コーティング装置を機械的に支えることが必要である。

【００９０】

ここで再び図８を参照すると、１つのアプリケータローラ６６がサイド支持部材７８、８０によって下部クレードルアセンブリ１００上にとりつけられており

、第２のアプリケータローラ６６がサイド支持部材８２、８４により上部クレードルアセンブリ１０２上にとりつけられている。この配置によると、インキング／コーティング装置１０は版胴上の版に対し印刷用インキ及び／又はコーティング材料を塗布すると同時に同じ印刷ユニットのブランケット胴上の版又はブランケットに対して印刷用インキ及び／又はコーティング材料を塗布することができる。同じ色のインキが、同じ印刷ユニット上で同時に版位置及びブランケット位置から上部及び下部アプリケータローラによって使用される場合、印刷ユニットの中を下地材が一回だけ通過する間に下地材Ｓに対して「２重の衝撃（ダブル・バンプ）」つまり２重のインキングフィルム又はコーティング層が塗布される。２つのインキ又はコーティング材料のタックは、２重の衝撃の間の優れた移送を得るため相容性のあるものでなくてはならない。その上、輪転オフセット巻取紙印刷機のブランケット胴に対して、又は専用コーティングユニットのブランケットに対してインキ又はコーティング材料を塗布するためにインキング／コーティング装置１０を使用することができる。

【００９１】

従来の金付け技術に従うと、金属（青銅）粉末は予め印刷された下地材に対しオフラインで塗布され、こうして粒子が粗くテクスチュア（質感）のある仕上げ又は外観が生み出される。従来のフレキソ印刷又は石版印刷により青銅材料のオンライン塗布は、平滑で連続した外観を生成するにすぎない。しかしながら、最高の品質の印刷には粒子の粗いテクスチュアのある仕上げが好ましく、これは本発明以前はオフライン方法によってのみ生み出すことができたことである。

【００９２】

ここで図１４及び図１５を参照すると、メタリックインキ又はコーティング材料が、青銅様のテクスチュアをもつ又は粒子の粗い外観をもつ平坦でない表面仕上げを生み出すべく上部及び下部アプリケータローラ６７Ｒ、６６の同時作業により下地材Ｓに対してオンラインで塗布される。本発明のシミュレーションされた金付け方法に従うと、フレキソ印刷用ブロンズインキは、図１４に示されているようにデュアルクレードルインキング／コーティング装置１０により版及びブランケットに同時に塗布される。弾力性アプリケータローラ６７Ｒが上部クレー

ドル１０２内にとりつけられ、アニロックスアプリケータローラ６６が下部クレードル１００上にとりつけられている。ローラは別々のドクターブレードタンク７０から供給を受けている。上部クレードル位置でドクターブレードタンク７０は、水性又はフレキソ印刷用インキの中に分散させられた比較的粗い金属粒子１４０をもつブランズインキ又はコーティング材料を供給する。粗粒子インキ又はコーティング材料は上部クレードル位置１０２で弾力性アプリケータローラ６７Ｒにより版Ｐに対して塗布される。同時に、比較的細かい金属粒子１４２をもつフレキソ印刷用及び／又はブロンズインキ又はコーティング材料が、下部クレードル１００上にとりつけられたアニロックスローラ６６によってブランケットＢに移送される。

【００９３】

上部及び下部アプリケータローラの計量用表面は、金属の粗粒子及び微粒子に対応する異なるセルサイズ及び体積容量をもつ。例えば、金属粗粒子１４０を移送する上部クレードル位置１０２にとりつけられたアニロックスローラ１１１は、好ましくは1インチあたり１００～３００ライン（1cmあたり３９～１１８ライン）の範囲内のスクリーンライン計数を有し、比較的細かい金属粒子１４２を移送する下部クレードル１００上にとりつけられたアニロックスローラ６６の計量用表面は、好ましくは1インチあたり２００～６００ライン（1cmあたり７９～２３６ライン）の範囲内のスクリーンライン計数を有する。

【００９４】

版からブランケットへの移送の後、金属微粒子１４２は、金属粗粒子１４０の上に1つの層を形成する。両方の青銅層が共に下地材Ｓ上にオフセットされるにつれて、金属微粒子１４２の層は下地材Ｓ上に印刷され、金属粗粒子１４０の最上層がテクスチュアのある粒子の粗い外観を提供する。金属微粒子１４２は、その他の場合ならば金属粗粒子１４０の間の空隙の中に見えると思われる下地材をカバーする。かくして、微粒子層の上の粗粒子層の組合せは、テクスチュアのある青銅様の仕上げ及び外観を提供する。

【００９５】

金属以外の粒子状材料を、テクスチュア仕上げを生み出すのに使用することも

できる。例えば、メッキされたプラスチック（光る物）の粗粒子及び微粒子、雲母粒子（パール）などを金属粒子の代りに用いて、限りない表面変化、外観及び効果を生み出すことができる。金属粒子を含む粒状材料はすべて、好ましくは固形で平坦な小板形状をしており、アニロックスアプリケータローラによる塗布に適したサイズ寸法を有する。例えば不規則な形状及びサイズを有するストーングリットといったその他の粒子状又は粒状の材料を使用することができ、優れた利点をもたらす。

【００９６】

光をよく反射する小板形状の固体金属粒子が、青銅様の外観及び効果を生み出すのに好ましい。しかしながら、光反射特性を有し得るさまざまなテクスチュア仕上げを、ストーングリットといった粒状材料を用いて生成することができる。最も一般的に使用される金属としては、銅、亜鉛及びアルミニウムが含まれる。所望の場合には、その他の延性金属を用いることができる。さらに、粗粒子と微粒子は同じ粒子状材料で作られている必要はない。粗粒子及び微粒子のそれぞれのためにさまざまな粒子状材料を利用することによりさまざまな効果及びテクスチュアのある外観を作り出すことができる。さらに、所望の特殊な又は表面の仕上げに応じて微粒子又は粗粒子のいずれかのインキ又はコーティング材料を上部クレードル位置から印刷でき、又は微粒子又は粗粒子のいずれかのインキ又はコーティング材料を下部クレードル位置から印刷することができる。

【００９７】

石版印刷、乾式、水性及びフレキソ印刷プロセスを含む付加的なインキング／コーティングケイパビリティ用に最後の印刷ユニット２８を構成することができる、ということがわかるだろう。最後の印刷ユニット上でさまざまな下地材表面効果（例えば２重衝撃又は３重衝撃式インキング／コーティング又は金付け）を実施することができる。３重衝撃式インキング／コーティングのためには、最後の印刷ユニット２８には、図３及び図４に示されているように補助的インラインインキング又はコーティング装置９７が備わっている。インラインインキング又はコーティング装置９７は、印刷又はコーティングされたばかりのあらゆる表面の効果又は特殊処理全体にわたりさらにもう１枚のインキフィルム又はコーティ

ング材料の保護又は装飾層を塗布して、３重衝撃を生成することを可能にする。３重衝撃は、下地材が最後の印刷ユニットの圧胴上にある間、印刷又はコーティングされたばかりの２重衝撃の上に同時に第３のインキフィルム又はコーティング材料層を塗布することによって達成される。

【００９８】

インラインインキング／コーティング装置９７が設置される場合、紙取り胴４２からＳＵＰＥＲ　ＢＬＵＥＲ 可とう性カバリングを除去することが必要であり、同様に図３及び図４に示されているとおり、紙取り胴４２上に版又はブランケットＢをとりつけることによってインキング／コーティング作業のために紙取り胴４２を修正又は転換することも必要である。版又はブランケットＢの下には胴貼り材料が置かれ、かくして、転換された紙取り胴４２及び最後の圧胴３６上の版又はブランケットＢの間のニップを通して移送するにつれて、印刷されたばかりの下地材Ｓ上にインキ又はコーティング材料が印刷又はコーティングされるように、適正な印刷用胴貼り済み半径方向クリアランスで版又はブランケットＢが胴張りされることになる。この配置によると、印刷又はコーティングされたばかりの下地材は、インキ又はコーティング材料の第２のフィルム又は層が最後の圧胴３６上でオーバープリンティング又はオーバーコーティングされている間に同時にインキ又はコーティング材料の第３のフィルム又は層でオーバープリンティング又はオーバーコーティングされる。

【００９９】

補助的インキング／コーティング装置９７及び転換された又は修正された紙取り胴４２は、デリバリ駆動シャフト４３上にとりつけられている。インキング／コーティング装置９７は、修正された又は転換された紙取り胴４２上の版又はブランケットＢに対しインキ又はコーティング材料を供給するため、アプリケータローラ、好ましくはアニロックスアプリケータローラ９７Ａを内含する。インラインインキング／コーティング装置９７及び修正された又は転換された紙取り胴４２は好ましくは、本明細書に参考として内含されているHoward W. DeMoore(共同発明者かつ譲受人）に対する米国特許第５，１７６，０７７号の中で記述されているとおりに製造される。インラインインキング／コーティング装置９７は、

米国テキサス州ダラスのPrinting Research Inc.により、その商標ＳＵＰＥＲＢＬＵＥ　ＥＺ　ＣＯＡＴＥＲTMで製造・販売されている。

【０１００】

紙取り胴４２がインキング／コーティング作業のために修正又は転換された後、版又はブランケットＢにより課せられるニップクリアランスの減少のため、修正された紙取り胴４２はもはや、印刷又はコーティングされたばかりの下地材を誘導し移送するというその当初の機能を果たすことができない。その代り、修正された又は転換された紙取り胴４２は、最後の圧胴３６上で同時に印刷又はコーティングされるにつれて、印刷又はコーティングされたばかりの下地材上に３番目の下位インキフィルム又はコーティング材料の層を印刷又はコーティングすることにより、インキング／コーティング装置９７の一部として機能する。その上、第２の下位インキフィルム又はコーティング層と第３の下位インキフィルム又はコーティング層の間の相互タックのため、オーバープリンティング又はオーバーコーティングされた下地材は、版又はブランケットに粘着することになり、かくして版又はブランケットからの下地材の分離に対抗又は抵抗する。

【０１０１】

この問題を補正するため、図３及び図４に示されているように、真空を用いた移送装置９９が、修正された又は転換された紙取り胴４２に隣接してとりつけられている。真空を用いた移送装置９９のもう１つの目的は、オーバープリンティング又はオーバーコーティングを受けたばかりの３重衝撃下地材がニップの中を移送されるにつれて、版又はブランケットＢからこの下地材を分離させることにある。真空を用いた移送装置９９は、オーバープリンティング又はオーバーコーティングされたばかりの下地材がニップ内を移送するにつれてこの下地材を横切って圧力差を生成し、かくして下地材上に分離力を生み出して版又はブランケットＢからのきれいな分離を提供する。

【０１０２】

真空を用いた移送装置９９は好ましくは、本明細書に参考として内含されている、すべて共同発明者であるHoward W. DeMoore に対する米国特許第５，１１３，２５５号、５，１２７，３２９号、５，２０５，２１７号；５，２２８，３９

１号；５，２４３，９０９号；及び５，４１９，２５４号で記述されているとおりに製造される。真空を用いた移送装置９９は、米国テキサス州ダラスのPrinting Research Inc.により、その商標ＢＡＣＶＡＣTMで製造・販売されている。

【０１０３】

本発明及びその利点について詳細に記述してきたが、添付の請求項によって規定されているとおりの本発明の精神又は範囲から逸脱することなくさまざまな変化、置換及び変更を加えることができるということも理解すべきである。

【図面の簡単な説明】

【図１】

本発明を実施するインキング／コーティング装置を有する枚葉紙供給式輪転オフセット印刷機の斜視図である。

【図２】

本発明の単一ヘッド、デュアルクレードル型インキング／コーティング装置の簡略化された斜視図である。

【図３】

第１、第２及び最後の印刷ユニットの従来の湿し装置位置に設置された単一ヘッド、デュアルクレードル型インキング／コーティング装置を有する図１の印刷機の概略的側面立面図である。

【図４】

第４の印刷ユニット上の印刷版及びブランケット上に同時に印刷するための作動的インキング／コーティング位置にある単一ヘッド、デュアルクレードル型インキング／コーティング装置を示す簡略化された側面立面図である。

【図５】

第１の印刷ユニットのブランケット上へのスポット又は全体的インキング又はコーティングのために作動的位置にある単一ヘッド、デュアルクレードル型インキング／コーティング装置を示し、かつ第２の印刷ユニットの印刷版上にスポット又は全体的インキング又はコーティングを施すために作動的位置にあるデュアルクレードルインキング／コーティング装置を示す、簡略化された側面立面図である。

【図６】

ブランケット上へのスポット又は全体的コーティングのために密封されたドクターブレードタンクアセンブリをもち、作動的コーティング位置にある単一ヘッド、デュアルクレードル式インキング／コーティング装置を示す、部分的に分解された図４及び図５の単一ヘッド、デュアルクレードル型インキング／コーティング装置の簡略化された側面断面図である。

【図７】

インキング／コーティング装置に対して、温度制御されたインキ又はコーティング材料を循環させるため、単一ヘッド、デュアルクレードル型インキング／コーティング装置に連結された熱交換器及びポンプのアセンブリを示す概略図である。

【図８】

代替的なコーティングヘッド配置を例示する、図６に類似し、部分的に分解された側面立面図である。

【図９】

印刷ユニットサイドフレーム部材上のインキング／コーティング装置の旋回式結合を例示する印刷ユニットの簡略化された立面図である。

【図１０】

それぞれ上部クレードルと下部のクレードル内に一対の分割型アプリケータローラがとりつけられている、図２に類似した図である。

【図１１】

分割型アプリケータローラの側面立面図である。

【図１２】

シール要素によって中央で仕切られたドクターブレードタンクの斜視図である。

【図１３】

図１２の仕切りシール要素に対する分割型アプリケータローラの密封係合を示す断面図である。

【図１４】

インキング／コーティングの変形実施態様を例示する、図８に類似した図である。

【図１５】

図１４のデュアルアプリケータローラの実施態様の同時操作により塗布される金付け様の仕上げを有する下地材の簡略化された側面立面図である。

【図１６】

分割型インキ出しパン上にとりつけられた別々の移送表面をもつパンローラの、一部断面図で表わされた側面立面図である。

【図１７】

下部クレードル上に取りつけられた単一ドクターブレードアセンブリ、アニロックスアプリケータローラを有する代替的なインキング／コーティングヘッド装置を例示する、部分的に分解されたデュアルクレードルインキング／コーティング装置の簡略化された側面立面図である。

【図１８】

別々の移送表面をもつ単一ドクターブレードアニロックスアプリケータローラアセンブリ、及び別々の外部供給源から異なるインキ又はコーティング材料の供給を受けている別々のインキ出し区画を有する分割型インキ出しパンの、部分的に断面図で表わされた側面立面図である。

【符号の説明】

１０、９７　インキング／コーティング装置

１２　印刷機

１４　印刷機フレーム

１６　枚葉紙フィーダ

２０　枚葉紙デリバリスタッカ

２２、２４、２６、２８　印刷ユニット

３０　インフィード渡し胴

３２　版胴

３４　ブランケット胴

３６　圧胴

４０　中間トランスファドラム

４２　紙取り胴

４３　デリバリシャフト

４４　デリバリコンベヤシステム

４８　デリバリ乾燥装置

５０　インキング装置

５２　インキングローラ列

５４　インキつぼ

５６　インキ出しローラ

５７　呼出しローラ

６２　油圧モータ

６６　アプリケータローラ

６８　密封型ドクターブレードアセンブリ

７０　タンク

７１　熱交換器

７４、７６　サイド支持部材

９９　移送装置

１００、１０２　クレードル

１１３　アニロックスアプリケータローラアセンブリ

１１７　インキ出しパン

１２４、１２６、１２８　乾燥装置／抽出装置ユニット

１３０　シール要素

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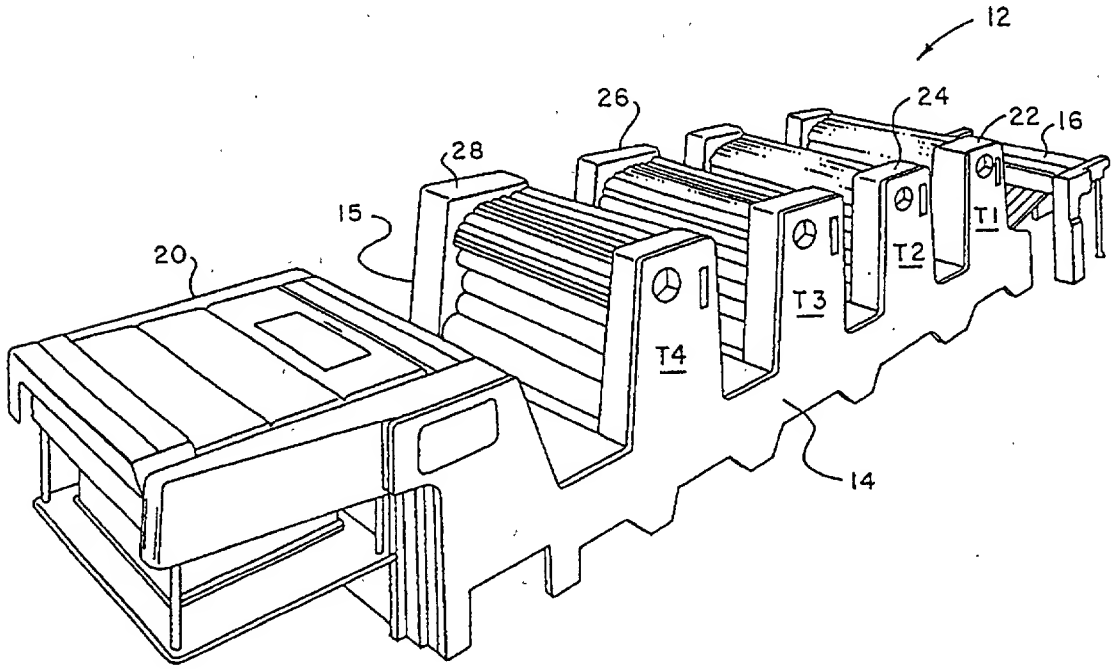
【書類名】 図面

【図１】


12
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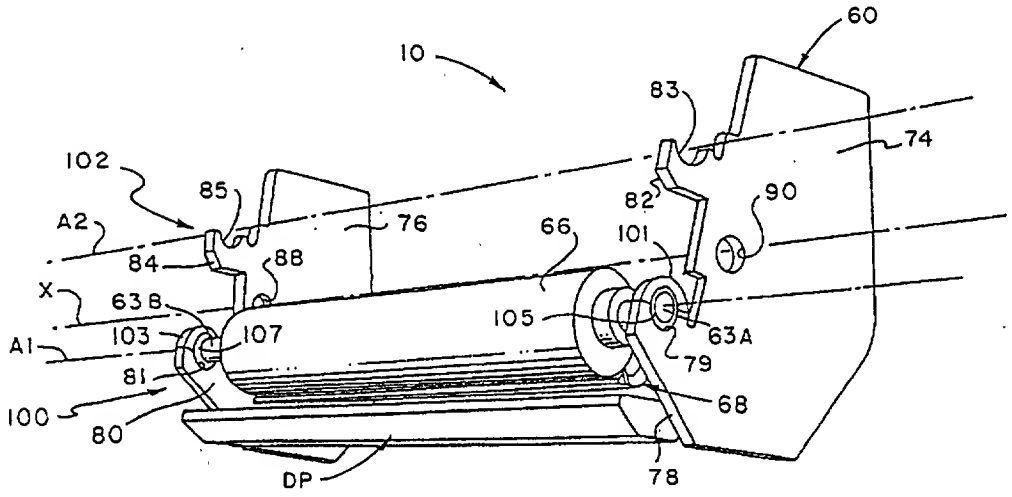
T1
T2
T3
T4
14

【図２】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100
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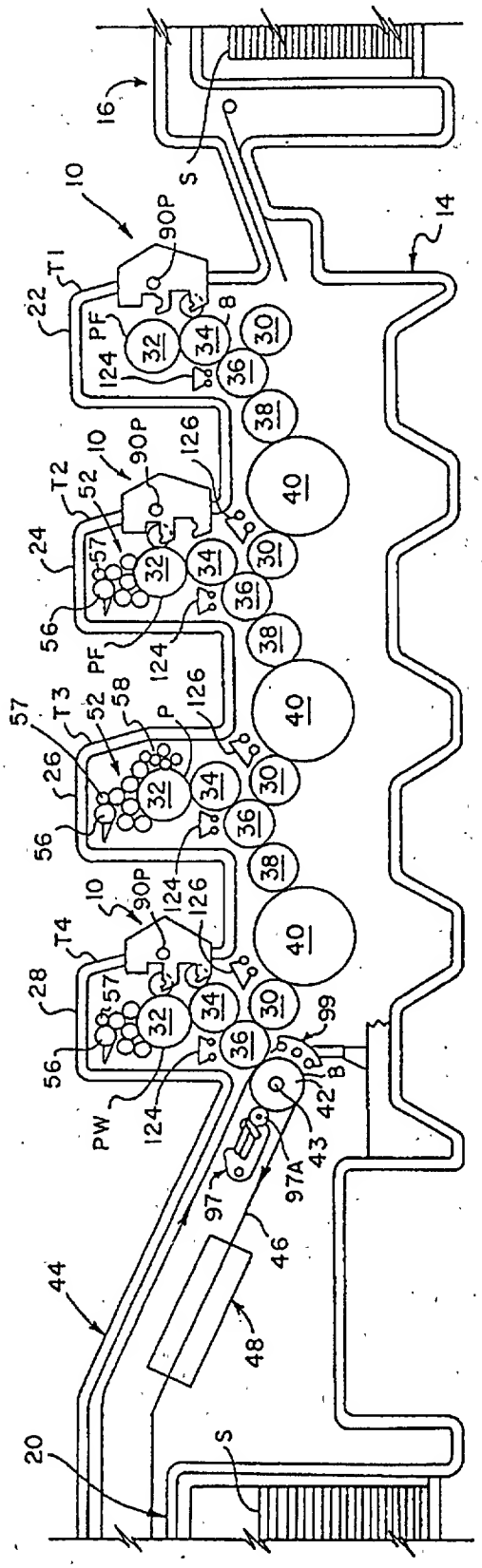
【図３】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90P
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T1
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124
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36
38
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T2
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57
56
126
T3
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T4
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PW
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97A
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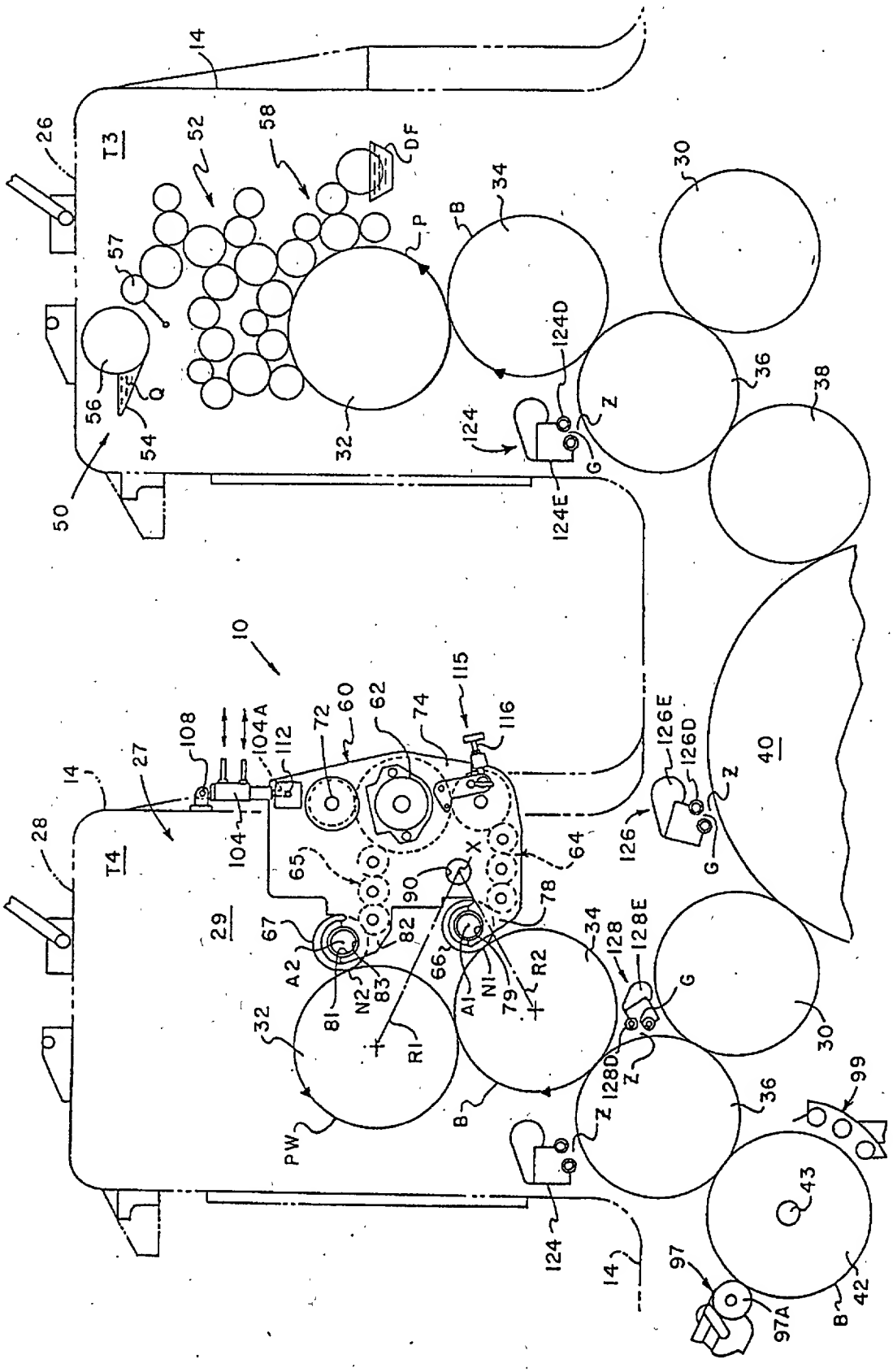
【図４】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G
Z
124E
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104A
112
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62
74
115
116
126E
126D
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T4
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82
66
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128
128E
A2
N2
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128D
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PW
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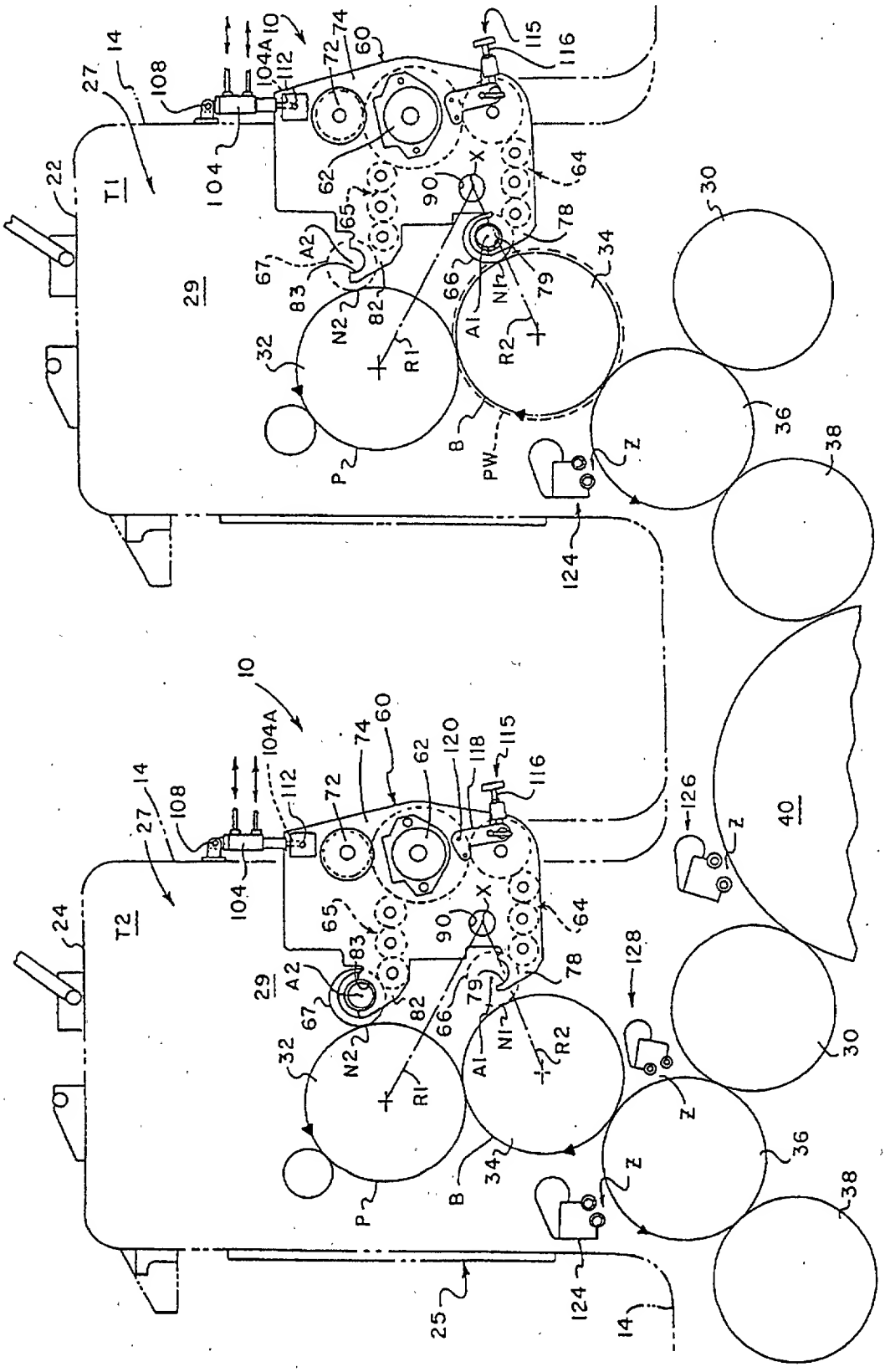
97
97A
42

【図５】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R1
R2
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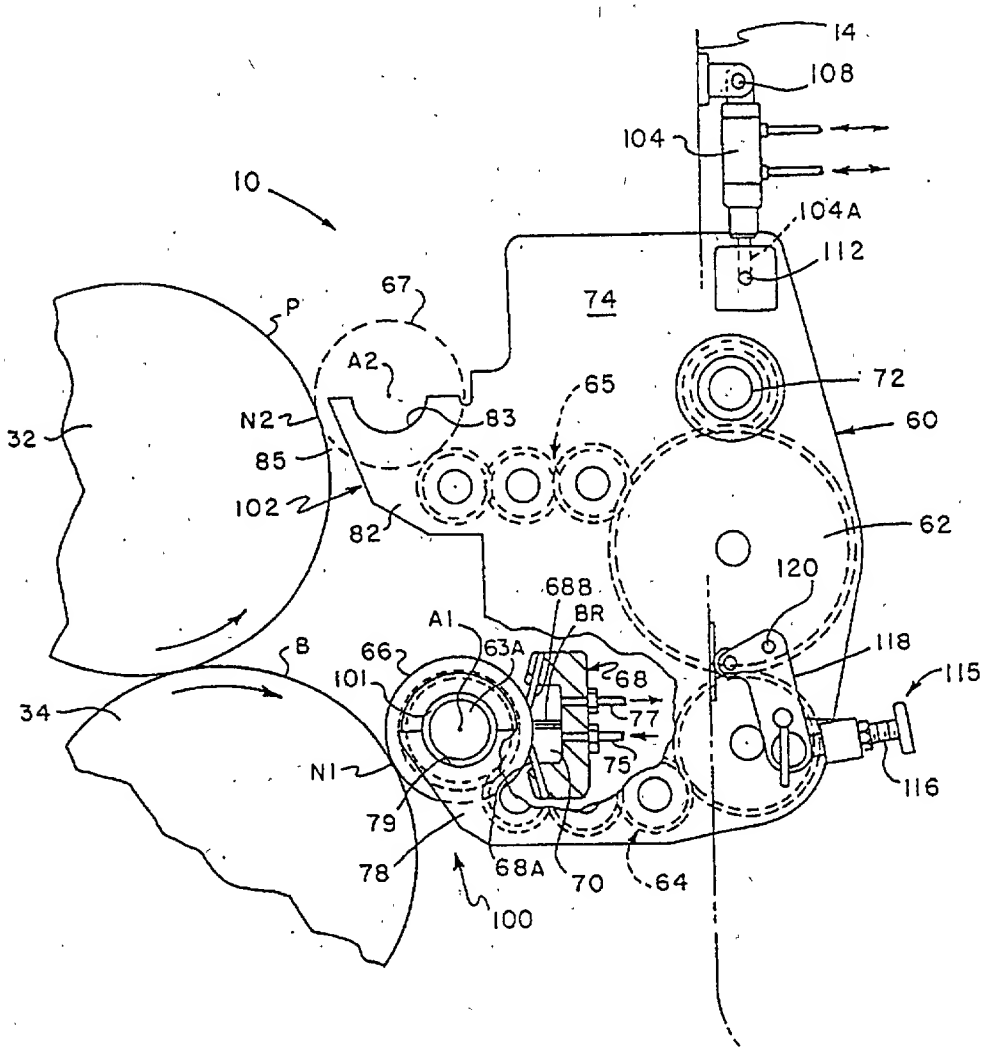
PW
X
Z

【図６】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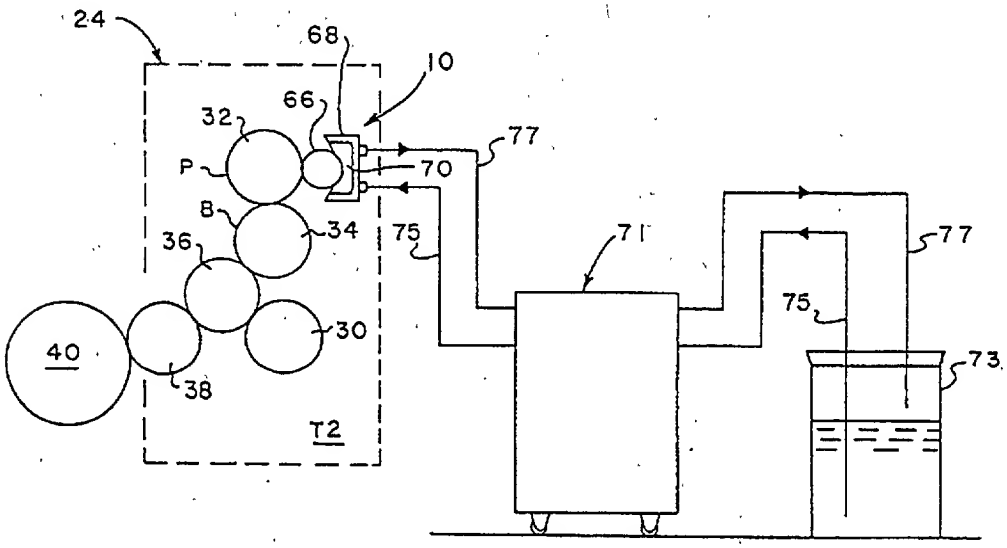
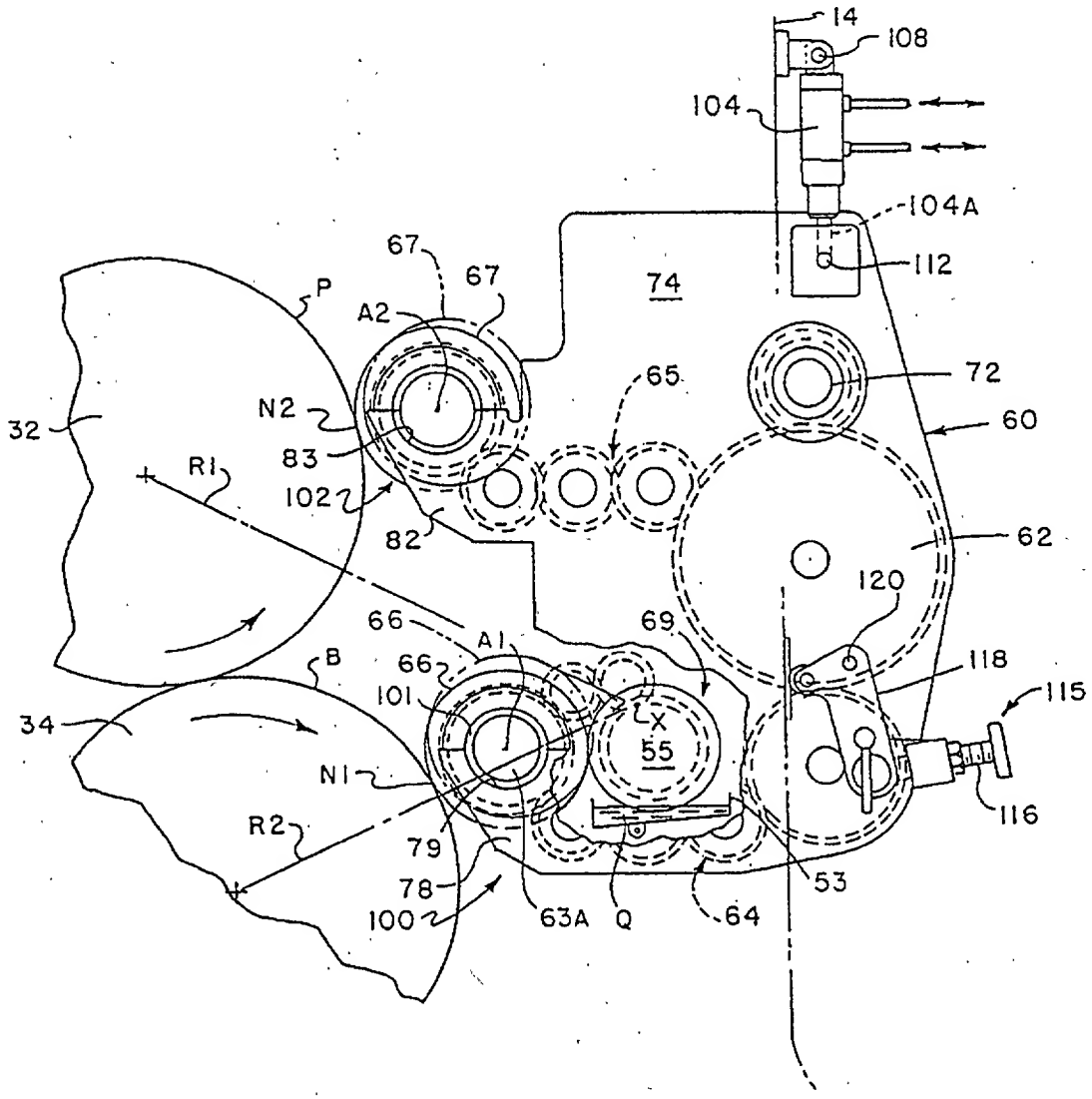
【図７】



【図8】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A1
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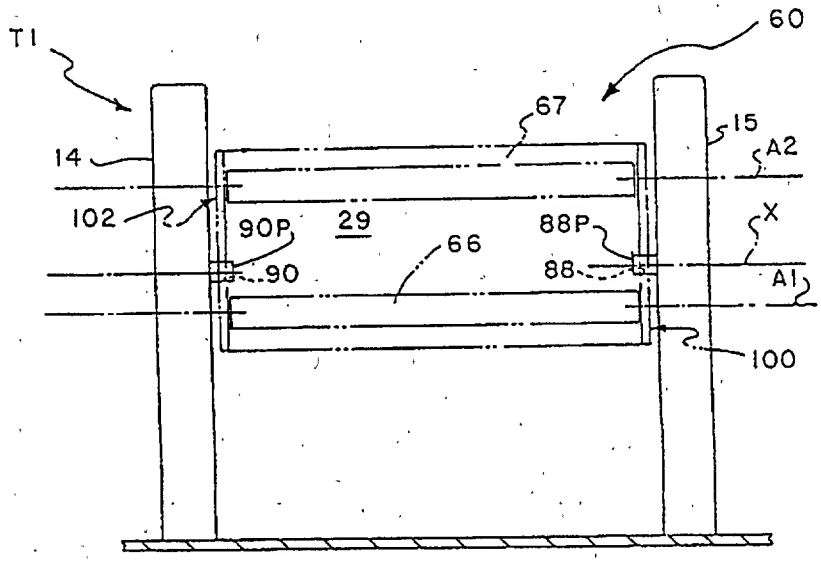
【図９】


T1
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X
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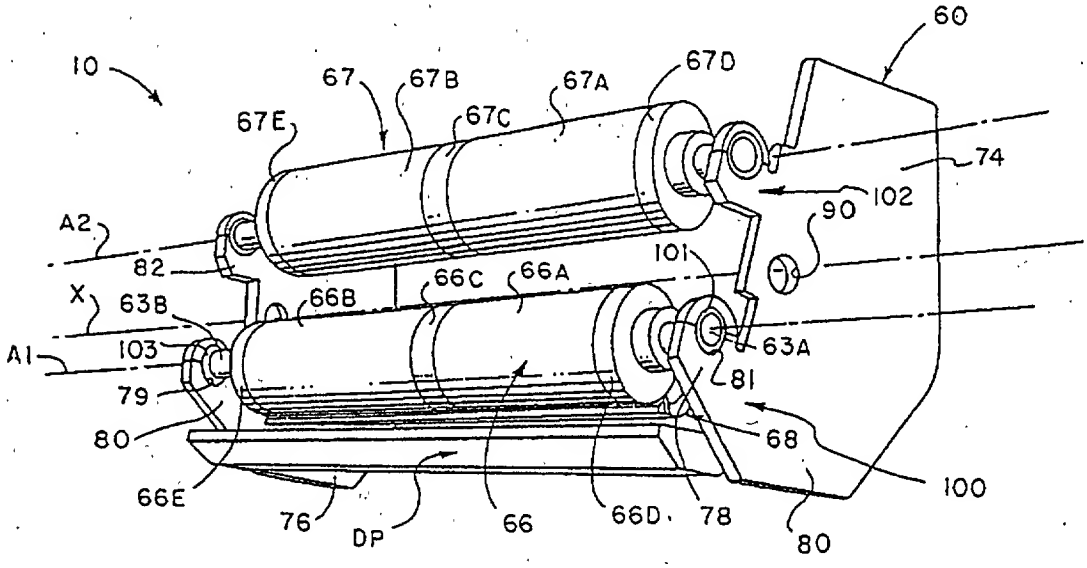
A1
100

【図１０】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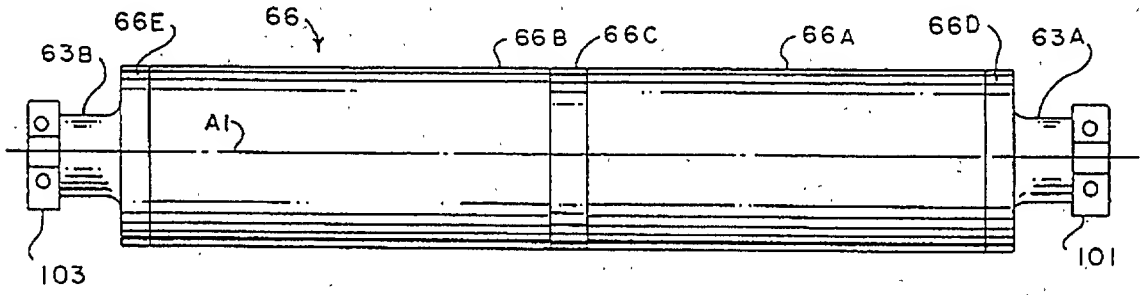
【図１１】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63B
A1
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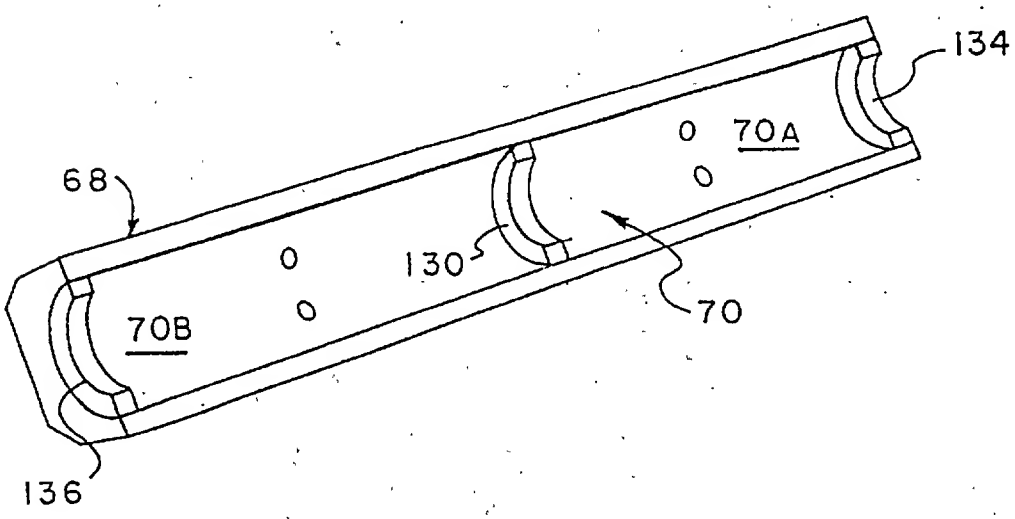
101

【図１２】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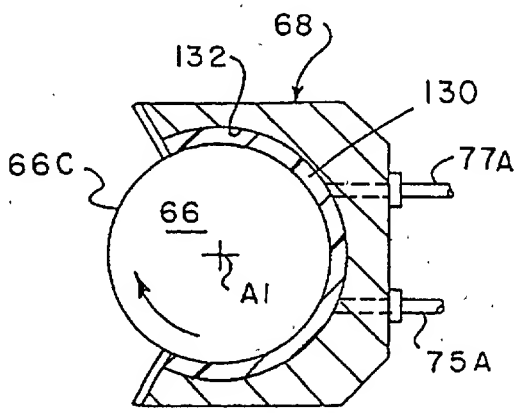
70B
136

【図１３】



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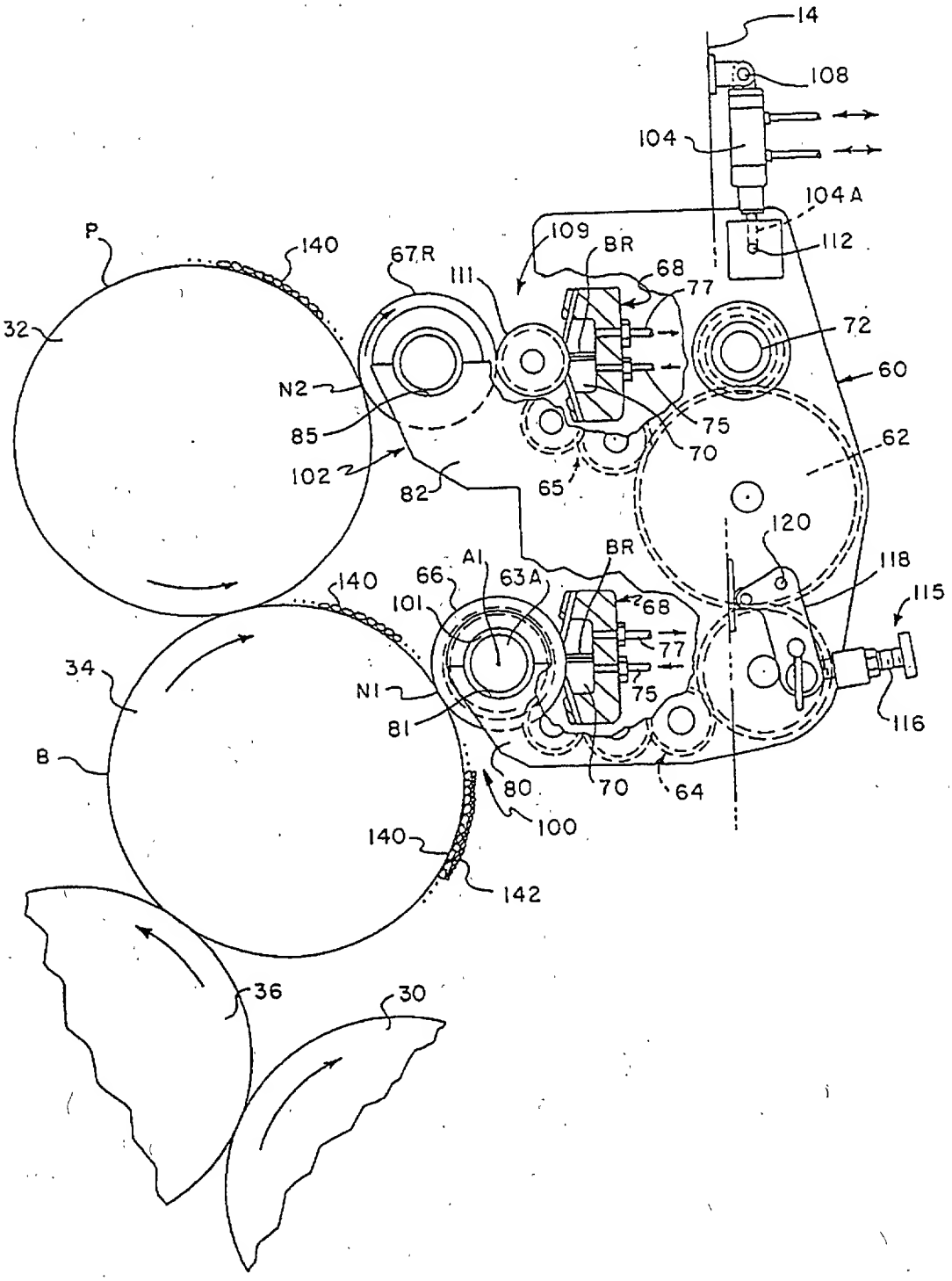
【図１４】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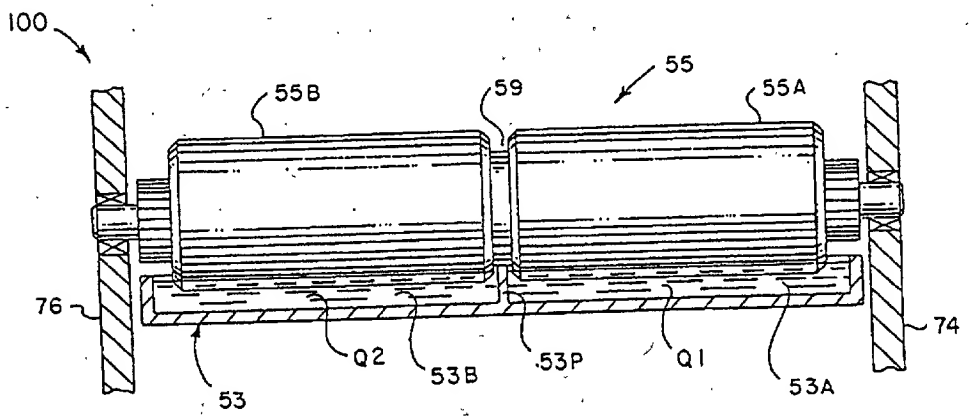
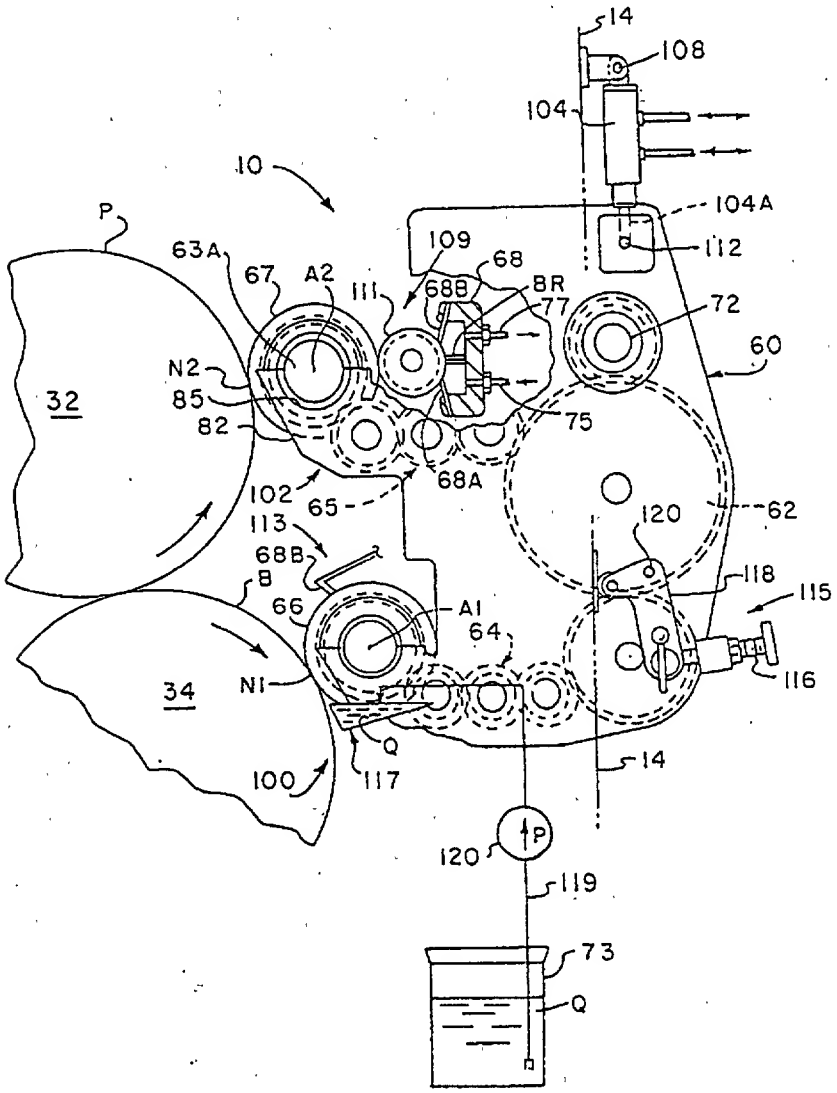
【図１５】

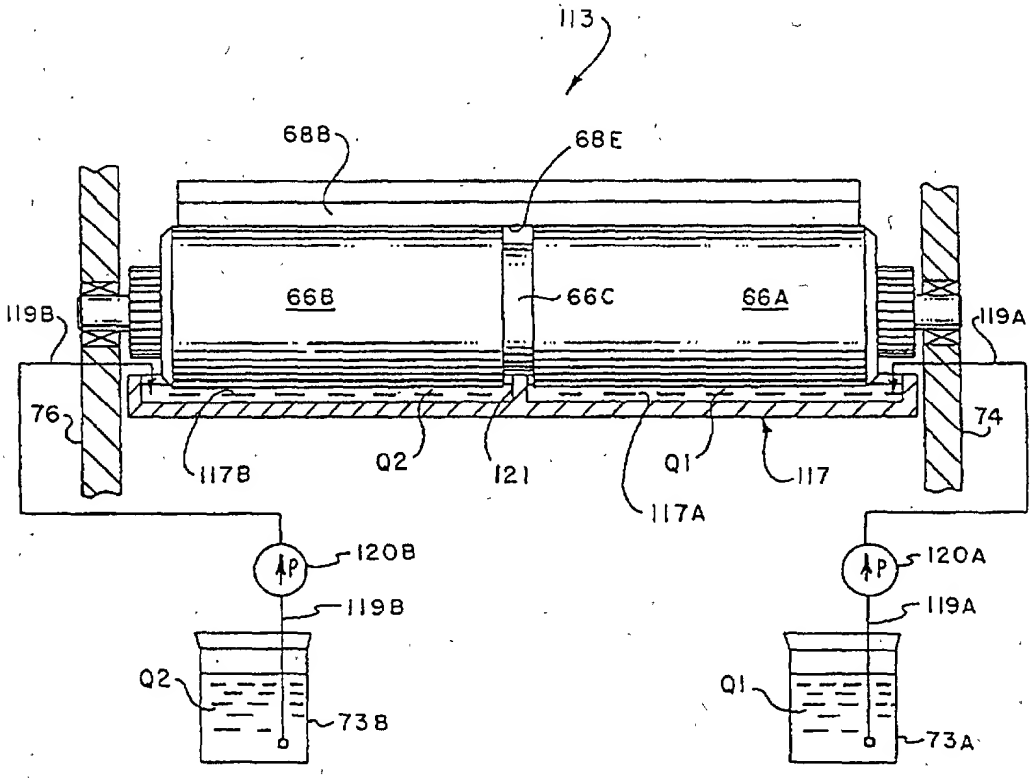
【図１６】



【図１７】


14
108
104
10
104A
P
109
68
63A
67
A2
111
68B
BR
77
72
112
60
N2
85
82
32
75
68A
102
65
120
62
113
68B
B
66
A1
64
118
115
116
34
N1
Q
117
14
100
120
P
119
73
Q

【図１８】


113
68B
68E
66B
66C
66A
119B
119A
76
74
117B
Q2
121
Q1
117
117A
120B
120A
119B
119A
Q2
Q1
73B
73A

【書類名】　要約書

【要約】

【課題】　引込み式インラインインキング／コーティング装置を備えた輪転オフセット印刷機において、その第１の印刷ユニット又はそれに続くいずれかの印刷ユニット上で版及び／又はブランケットに対し、スポットで又は全体的にインキング／コーティング材料を塗布することができるようにする。

【解決手段】　インキング／コーティング装置は、あらゆる石版印刷ユニットの従来の湿し装置スペース内に、旋回する形でとりつけられる。フレキソ印刷用インキ又は水性コーティング材料の水性成分は、印刷及びコーティングされたばかりの枚葉紙上の水性又はフレキソ印刷用インキ又はコーティング材料が乾燥し、次の印刷ユニット上でドライトラッピングされ得るように、高速高温空気乾燥装置及び高性能熱・水分抽出装置によって蒸発及び乾燥させられる。

【選択図】　図１

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